

APPENDIX I

Serial No.: 09/955,604

Docket No.: 49933US032

Claims 23, 24, 30-32, 89, 90, 92, 93, 134-136, 138-143, and 145-148 are provided below.

23. A production tool suitable for use in manufacturing an abrasive article comprising a first, second, and third plurality of cavities, wherein the first plurality of cavities each have a first geometric shape and first plurality of angles forming the geometric shape, the second plurality of cavities each have a second geometric shape and second plurality of angles forming the geometric shape, and the third plurality of cavities each have a third geometric shape and third plurality of angles forming the geometric shape, wherein at least one of the angles of the first plurality is different from all of the angles of the second and third plurality of angles, wherein at least one of the angles of the second plurality is different from all of the angles of the first and third plurality of angles, and wherein each of the cavities has a single opening.

24. A production tool suitable for use in manufacturing an abrasive article comprising a first, second, third, and fourth plurality of cavities, wherein the first plurality of cavities each have a first geometric shape and first plurality of angles forming the geometric shape, the second plurality of cavities each have a second geometric shape and second plurality of angles forming the geometric shape, the third plurality of cavities each have a third geometric shape and third plurality of angles forming the geometric shape, and the fourth plurality of cavities each have a fourth geometric shape and fourth plurality of angles forming the geometric shape, wherein at least one of the angles of the first plurality is different from all of the angles of the second, third, and fourth plurality of angles, wherein at least one of the angles of the second plurality is different from all of the angles of the first, third, and fourth plurality of angles, wherein at least one of the angles of the third plurality is different from all of the angles of the first, second, and fourth plurality of angles, and wherein each of the cavities has a single opening.

30. A production tool suitable for use in manufacturing an abrasive article comprising a plurality of cavities defining at least a first, a second, and a third group, wherein a first group of cavities has a first shape, a second group of cavities has a second shape, a third group of cavities has a third shape, wherein the first, second, and third shapes are all different, and wherein each of the cavities has a single opening.

31. A production tool suitable for use in manufacturing an abrasive article comprising a plurality of cavities defining at least a first, a second, and a third group, wherein a first group of cavities has a first size, a second group of cavities has a second size, a third group of cavities has a third size, wherein the first, second, and third sizes are all different, and wherein each of the cavities has a single opening.

32. A production tool suitable for use in manufacturing an abrasive article comprising a plurality of cavities defined by substantially distinct and discernible boundaries which include substantially specific dimensions, wherein a first cavity has specific first dimensions, a second cavity has specific second dimensions, and a third cavity has specific third dimensions, each of said cavities has a boundary defined by at least four planar surfaces wherein adjacent planar surfaces of one cavity meet at an edge to define an angle of intersection therebetween, wherein at least one angle of intersection of said first cavity is different from all the angles of intersection of said second and third cavities, wherein at least one angle of intersection of said second cavity is different from all the angles of intersection of said first and third cavities, and wherein each of the cavities has a single opening.

89. The production tool of claim 23, wherein the first geometric shape includes a base and first plurality of base edge lengths, wherein the second geometric shape includes a base and

second plurality of base edge lengths, wherein the third geometric shape includes a base and third plurality of base edge lengths, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second and third plurality of base edge lengths, and wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first and third plurality of base edge lengths.

90. The production tool of claim 24, wherein the first geometric shape includes a base and first plurality of base edge lengths, wherein the second geometric shape includes a base and second plurality of base edge lengths, wherein the third geometric shape includes a base and third plurality of base edge lengths, wherein the fourth geometric shape includes a base and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second, third, and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first, third, and fourth plurality of base edge lengths, and wherein at least one of the base edge lengths of the third plurality is different from all of the base edge lengths of the first, second, and fourth plurality of base edge lengths.

92. A production tool suitable for use in manufacturing an abrasive article comprising a first, second, and third plurality of cavities, wherein the first plurality of cavities each have a first geometric shape including a base and first plurality of base edge lengths forming the base of the geometric shape, the second plurality of cavities each have a second geometric shape including a base and second plurality of base edge lengths forming the base of the geometric shape, and the third plurality of cavities each have a third geometric shape including a base and third plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second and third plurality of

base edge lengths, wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first and third plurality of base edge lengths, and wherein each of the cavities has a single opening.

93. A production tool suitable for use in manufacturing an abrasive article comprising a first, second, third, and fourth plurality of cavities, wherein the first plurality of cavities each have a first geometric shape including a base and first plurality of base edge lengths forming the base of the geometric shape, the second plurality of cavities each have a second geometric shape including a base and second plurality of base edge lengths forming the base of the geometric shape, the third plurality of cavities each have a third geometric shape including a base and third plurality of base edge lengths forming the base of the geometric shape, and the fourth plurality of cavities each have a fourth geometric shape including a base and fourth plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second, third, and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first, third, and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the third plurality is different from all of the base edge lengths of the first, second, and fourth plurality of base edge lengths, and wherein each of the cavities has a single opening.

134. The production tool of claim 92, wherein the first, second, and third geometric shapes are pyramidal.

135. The production tool of claim 92, wherein the first, second, and third geometric shapes are truncated pyramidal.

136. A production tool suitable for use in manufacturing an abrasive article comprising a first, second, and third row of cavities, wherein the cavities each have a geometric shape including a base and a plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first row of cavities is different from all the base edge lengths of the second and third rows of cavities, wherein at least one of the base edge lengths of the second row of cavities is different from all the base edge lengths of the first and third row of cavities, and wherein each of the cavities has a single opening.

138. The production tool of claim 136, wherein the geometric shape of the cavities in the first, second, and third rows are pyramidal.

139. The production tool of claim 136, wherein the geometric shape of the cavities in the first, second, and third rows are truncated pyramidal.

140. The production tool of claim 136, wherein the first, second, and third rows of cavities extend in parallel to one another.

141. The production tool of claim 136, wherein the base edge lengths of the first row of cavities have a first base edge length extending parallel to the first row and a second base edge length extending perpendicular to the first row, and wherein the second base length of all the cavities in the first row is the same.

142. The production tool of claim 141, wherein at least some of the first base lengths of the cavities in the first row are different from one another.

143. A production tool suitable for use in manufacturing an abrasive article comprising first, second, and third cavities, wherein the first cavity has a first geometric shape including a base and a first plurality of base edge lengths forming the base of the geometric shape, the second cavity has a second geometric shape including a base and a second plurality of base edge lengths forming the base of the geometric shape, and the third cavity has a third geometric shape including a base and a third plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality of base edge lengths is different from all the base edge lengths of the second and third plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality of base edge lengths is different from all the base edge lengths of the first and third plurality of base edge lengths, and wherein each of the cavities has a single opening.

145. The production tool of claim 143, wherein the geometric shapes of the first, second, and third cavities are pyramidal.

146. The production tool of claim 143, wherein the geometric shapes of the first, second, and third cavities are truncated pyramidal.

147. The production tool of claim 143, wherein the first cavity is located adjacent to the second cavity.

148. The production tool of claim 147, wherein the second cavity is located adjacent to the third cavity.

APPENDIX II

Serial No.: 09/955,604

Docket No.: 49933US032

Communication filed September 19, 2001.

PATENT

Docket No. 49933US032

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): HOOPMAN et al.)
)
)
Serial No.: Unassigned)
Serial No. of Parent: 09/520,032)
)
Confirmation No.: Unknown)
)
Filing Date: Herewith)
Filing Date of Parent: March 6, 2000)
)
For: **TOOLS TO MANUFACTURE ABRASIVE ARTICLES**

COMMUNICATION

Assistant Commissioner for Patents
Attn: Box Patent Application
Washington, D.C. 20231

Sir:

Prior to taking up the above-identified patent application, the Examiner is requested to consider the accompanying remarks. The pending claims are claims 23-24, 30-32, 56-57, 63-64, 89-90, 92-93, 113-114, and 133-153. Support for these claims can be found throughout the specification, including the originally filed claims and drawings, as would be clearly understood by one of skill in the art. Examples of locations of support for these new claims are listed in the table below.

Claim 1-21	Support can be found, e.g., in the originally filed claims in the parent application Serial No. 09/520,032 (filed March 6, 2000).
Claim 22	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 20, line 27 through page 21, line 2; and at page 26, line 16 through page 27, line 7.
Claim 23	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page

Communication

Serial No.: Unassigned

Filed: Herewith

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

Page 2 of 13

	10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 20, line 27 through page 21, line 2; and at page 26, line 16 through page 27, line 7.
Claim 24	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 20, line 27 through page 21, line 2; and at page 26, line 16 through page 27, line 7.
Claim 25	Support can be found, e.g., at page 6, lines 18-25; at page 20, line 27 through page 21, line 18; and at page 26, line 16 through page 27, line 7.
Claim 26	Support can be found, e.g., at page 6, lines 18-25; at page 20, line 27 through page 21, line 18; and at page 26, line 16 through page 27, line 7.
Claim 27	Support can be found, e.g., at page 6, lines 18-25; at page 20, line 27 through page 21, line 18; and at page 26, line 16 through page 27, line 7.
Claim 28	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 19, lines 14-20; at page 20, line 27 through page 21, line 18; and at page 26, line 16 through page 27, line 7.
Claim 29	Support can be found, e.g., at page 6, lines 18-25; at page 10, lines 5-10; at page 11, lines 19-28; at page 21, lines 19-26; and at page 26, line 16 through page 27, line 7.
Claim 30	Support can be found, e.g., at page 6, line 18 through page 7, line 15; and at page 26, line 16 through page 27, line 7.
Claim 31	Support can be found, e.g., at page 6, line 18 through page 7, line 15; and at page 26, line 16 through page 27, line 7.
Claim 32	Support can be found, e.g., at page 6, lines 18-25; at page 7, lines 6-15; at page 26, line 16 through page 27, line 7; and in originally filed claim 1.
Claim 33-43	Support can be found, e.g., at page 28, lines 12-17; and above with respect to claims 22-32.
Claim 44-54	Support can be found, e.g., at page 28, lines 12-17; and above with respect to

Communication

Page 3 of 13

Serial No.: Unassigned

Filed: Herewith

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

	claims 22-32.
Claim 55	Support can be found, e.g., at page 6, line 18 through page 8, line 24; at page 19, lines 14-20; at page 20, line 27 through page 21, line 2; at page 26, line 16 through page 27, line 7; and in originally filed claim 6.
Claim 56	Support can be found, e.g., at page 6, line 18 through page 8, line 24; at page 10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; and in originally filed claim 6.
Claim 57	Support can be found, e.g., at page 6, line 18 through page 8, line 24; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; and in originally filed claim 6.
Claim 58	Support can be found, e.g., at page 6, lines 18-25; at page 7, line 16 through page 8, line 24; at page 20, line 27 through page 21, line 18; at page 26, line 16 through page 27, line 7; and in originally filed claim 6.
Claim 59	Support can be found, e.g., at page 6, lines 18-25; at page 7, line 16 through page 8, line 24; at page 20, line 27 through page 21, line 18; at page 26, line 16 through page 27, line 7; and in originally filed claim 6.
Claim 60	Support can be found, e.g., at page 6, lines 18-25; at page 7, line 16 through page 8, line 24; at page 20, line 27 through page 21, line 18; at page 26, line 16 through page 27, line 7; and in originally filed claim 6.
Claim 61	Support can be found, e.g., at page 6, line 18 through page 8, line 24; at page 19, lines 14-20; at page 20, line 27 through page 21, line 18; at page 26, line 16 through page 27, line 7; and in originally filed claim 6.
Claim 62	Support can be found, e.g., at page 6, lines 18-25; at page 7, line 16 through page 8, line 24; at page 10, lines 5-10; at page 11, lines 19-28; at page 21, lines 19-26; and at page 26, line 16 through page 27, line 7; and in originally filed claim 6.

Communication

Page 4 of 13

Serial No.: Unassigned

Filed: Herewith

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

Claim 63	Support can be found, e.g., at page 6, line 18 through page 8, line 24; at page 26, line 16 through page 27, line 7; and in originally filed claim 6.
Claim 64	Support can be found, e.g., at page 6, line 18 through page 8, line 24; at page 26, line 16 through page 27, line 7; and in originally filed claim 6.
Claim 65	Support can be found, e.g., at page 6, lines 18 through page 8, line 24; at page 26, line 16 through page 27, line 7; and in originally filed claims 1 and 6.
Claim 66-76	Support can be found, e.g., at page 28, lines 12-17; and above with respect to claims 55-65.
Claim 77-87	Support can be found, e.g., at page 28, lines 12-17; and above with respect to claims 55-65.
Claim 88, 91	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 19, lines 14-20; at page 20, line 27 through page 21, line 2; at page 26, line 16 through page 27, line 7; and at page 10, lines 23-27.
Claim 89, 92	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; and at page 10, lines 23-27.
Claim 90, 93	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; and at page 10, lines 23-27.
Claim 94	Support can be found, e.g., at page 6, lines 18-25; at page 20, line 27 through page 21, line 18; at page 26, line 16 through page 27, line 7; and at page 10, lines 23-27.
Claim 95	Support can be found, e.g., at page 6, lines 18-25; at page 20, line 27 through page 21, line 18; at page 26, line 16 through page 27, line 7; and at page 10, lines 23-27.
Claim 96	Support can be found, e.g., at page 6, lines 18-25; at page 20, line 27 through

	page 21, line 18; at page 26, line 16 through page 27, line 7; and at page 10, lines 23-27.
Claim 97	Support can be found, e.g., at page 6, lines 18-25; at page 10, lines 5-10; at page 11, lines 19-28; at page 21, lines 19-26; at page 26, line 16 through page 27, line 7; and at page 10, lines 23-27.
Claims 98-104	Support can be found, e.g., at page 28, lines 12-17; and above with respect to claims 91-97.
Claims 105-111	Support can be found, e.g., at page 28, lines 12-17; and above with respect to claims 91-97.
Claim 112	Support can be found, e.g., at page 6, line 18 through page 8, line 24; at page 19, lines 14-20; at page 20, line 27 through page 21, line 2; at page 26, line 16 through page 27, line 7; in originally filed claim 6; and at page 10, lines 23-27.
Claim 113	Support can be found, e.g., at page 6, line 18 through page 8, line 24; at page 10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; in originally filed claim 6; and at page 10, lines 23-27.
Claim 114	Support can be found, e.g., at page 6, line 18 through page 8, line 24; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; in originally filed claim 6; and at page 10, lines 23-27.
Claim 115	Support can be found, e.g., at page 6, lines 18-25; at page 7, line 16 through page 8, line 24; at page 20, line 27 through page 21, line 18; at page 26, line 16 through page 27, line 7; in originally filed claim 6; and at page 10, lines 23-27.
Claim 116	Support can be found, e.g., at page 6, lines 18-25; at page 7, line 16 through page 8, line 24; at page 20, line 27 through page 21, line 18; at page 26, line 16 through page 27, line 7; in originally filed claim 6; and at page 10, lines 23-27.
Claim 117	Support can be found, e.g., at page 6, lines 18-25; at page 7, line 16 through page 8, line 24; at page 20, line 27 through page 21, line 18; at page 26, line 16

Communication

Pag 6 of 13

Serial No.: Unassigned

Filed: Herewith

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

	through page 27, line 7; in originally filed claim 6; and at page 10, lines 23-27.
Claim 118	Support can be found, e.g., at page 6, lines 18-25; at page 7, line 16 through page 8, line 24; at page 10, lines 5-10; at page 11, lines 19-28; at page 21, lines 19-26; and at page 26, line 16 through page 27, line 7; in originally filed claim 6; and at page 10, lines 23-27.
Claim 119-125	Support can be found, e.g., at page 28, lines 12-17; and above with respect to claims 112-118.
Claim 126-132	Support can be found, e.g., at page 28, lines 12-17; and above with respect to claims 112-118.
Claim 133	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; and at page 10, lines 23-27.
Claim 134	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; at page 10, lines 23-27; and at page 22, lines 14-16.
Claim 135	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; at page 10, lines 23-27; and at page 22, lines 14-16.
Claim 136	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; at page 10, lines 23-27; and at page 22, lines 14-16.
Claim 137	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; and at page 10, lines 23-27.
Claim 138	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 26, line 16

Communication

Serial No.: Unassigned

Filed: Herewith

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

Page 7 of 13

	through page 27, line 7; at page 10, lines 23-27; and at page 22, lines 14-16.
Claim 139	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; at page 10, lines 23-27; and at page 22, lines 14-16.
Claim 140	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; and at page 10, lines 23-27.
Claim 141	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; and at page 10, lines 23-27.
Claim 142	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; and at page 10, lines 23-27.
Claim 143	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; and at page 10, lines 23-27.
Claim 144	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; and at page 10, lines 23-27.
Claim 145	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; at page 10, lines 23-27; and at page 22, lines 14-16.
Claim 146	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; at page 10, lines 23-27; and at page 22, lines 14-16.
Claim 147	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page

Communication

Serial No.: Unassigned

Filed: Herewith

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

Page 8 of 13

	10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; and at page 10, lines 23-27.
Claim 148	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; and at page 10, lines 23-27.
Claim 149	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; and at page 10, lines 23-27.
Claim 150	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; and at page 10, lines 23-27.
Claim 151	Support can be found, e.g., at page 6, lines 18-25; at page 7, lines 6-15; at page 26, line 16 through page 27, line 7; and in originally filed claim 1.
Claim 152	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; at page 10, lines 23-27; and at page 22, lines 14-16.
Claim 153	Support can be found, e.g., at page 6, line 18 through page 7, line 15; at page 10, line 23 through page 11, line 2; at page 19, lines 14-20; at page 26, line 16 through page 27, line 7; and at page 10, lines 23-27.

Remarks

In the parent application, Serial No. 09/520,032, filed March 6, 2000, claims 14-16, 18, 22-24, 29-32, 88-93, and 97 were rejected under §102(e) in view of Calhoun et al. (U.S. Patent No. 5,437,754). Such claims are being re-presented herein as claims 14-16, 18, 22-24, 29-32, 88-93, and 97, respectively, except claims 14-16, 18, 22, 29, 88, 91, and 97 have been cancelled in the accompanying Request for Filing a Continuation Application, and the following claims have been amended: 30 (to recite a third group of cavities having a third shape), 31 (to recite a third

group of cavities having a third size), 32 (to recite a third cavity having third dimensions). Additional amendments have been made, the majority of which are primarily typographical in nature.

Also being presented are new claims 133-148, which are directed to a production tool, as well as former claims 56-57, 63-64, and 113-114, which are all independent claims directed to a method of making a production tool, and new claims 149-153, which are also method claims.

In view of the §102(e) (anticipation) rejection in the parent application based on Calhoun et al. the following comments are being provided to explain why a §102(e) (anticipation) rejection based on Calhoun et al. would not be proper for the instant claims.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." M.P.E.P. §2131 (quoting Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)). "The identical invention must be shown in as complete detail as is contained in the . . . claim." M.P.E.P. §2131 (quoting Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989)).

"The standards of anticipation are strict. The invention must be disclosed within the four corners of a single reference. If a reference is silent or ambiguous with respect to an element or feature of the invention, that gap cannot be filled by an assumption or by combining one reference with another. An anticipating reference must teach the invention. It is not sufficient to point to silence or ambiguity after the invention and argue that the invention could be made out from the reference." Plastering Development Center, Inc. v. Perma Glas-Mesh Corp., 371 F.Supp. 939, 943, 944, 179 USPQ 838, 841 (N.D. Ohio 1973) (quoting General Tire & Rubber Co. v. The Firestone Tire & Rubber Co., 349 F.Supp. 345, 356, 174 USPQ 427, 442, 443 (N.D. Ohio 1972)). Anticipation cannot be predicated on teachings in a reference that are vague or based on conjecture. W.L. Gore & Assoc. v. Garlock, Inc., 721 F.2d 1540, 1554, 220 USPQ 303 (Fed. Cir. 1983).

“Anticipation requires the presence in a single prior art disclosure of all elements of a claimed invention arranged as in the claim.” Jamesbury Corp. v. Litton Industrial Products, 756 F.2d 1556, 1560, 225 USPQ 253, 256 (Fed. Cir. 1985) (quoting Connell v. Sears, Roebuck & Co., 722 F.2d 1542, 1548, 220 USPQ 193, 198 (Fed. Cir. 1983)); Soundsciber Corp. v. U.S., 175 Ct.Cl. 644, 360 F.2d 954, 960, 148 USPQ 298, 301 (1966). A prior art disclosure that ‘almost’ meets that standard may render the claim invalid under §103; it does not ‘anticipate.’ Jamesbury Corp. v. Litton Industrial Products, 225 USPQ 253, 256 (Fed. Cir. 1985) (quoting from Connell v. Sears, Roebuck & Co., 722 F.2d 1542, 1548, 220 USPQ 193, 198 (Fed. Cir. 1983)).

Although Calhoun et al. do generally disclose a production tool having three-dimensional cavities that can be of different sizes and/or shapes, such shapes being truncated cones, truncated pyramids, cubes, cylinders, elongated troughs, chevrons, intersecting grooves, hemispheres, and combinations thereof, there is no specific disclosure of Applicants’ invention as claimed. For example:

Calhoun et al. do not specifically teach the presence of at least three pluralities of cavities having a plurality of angles forming a geometric shape, wherein at least one of the angles of the first plurality is different from all the angles of each of the second and third plurality of angles, and at least one of the angles of the second plurality is different from all the angles of each of the first and third plurality of angles (see claims 23 and 56).

Calhoun et al. do not specifically teach the presence of at least four pluralities of cavities having a plurality of angles forming a geometric shape, wherein at least one of the angles of the first plurality is different from all the angles of each of the second, third, and fourth plurality of angles, at least one of the angles of the second plurality is different from all the angles of each of the first, third, and fourth plurality of angles, and at least one of the angles of the third plurality is different from all the angles of each of the first, second, and fourth plurality of angles (see claims 24 and 57).

Calhoun et al. do not specifically teach the presence of at least three pluralities of cavities having different shapes (see claims 30 and 63) or at least three pluralities of cavities having different

sizes (see claims 31 and 64).

Calhoun et al. do not specifically teach the presence of at least three cavities each having a boundary defined by at least four planar surfaces wherein adjacent planar surfaces of one cavity meet at an edge to define an angle of intersection therebetween, wherein at least one angle of intersection of the first cavity is different from all the angles of intersection of the second and third cavities, and at least one angle of intersection of the second cavity is different from all the angles of intersection of the first and third cavities (see claims 32 and 151).

Calhoun et al. do not specifically teach the presence of at least three pluralities of cavities having a plurality of base edge lengths forming the base of a geometric shape, wherein at least one of the base edge lengths of the first plurality is different from all the base edge lengths of each of the second and third plurality of base edge lengths, and at least one of the base edge lengths of the second plurality is different from all the base edge lengths of each of the first and third plurality of base edge lengths (see claims 92 and 113).

Calhoun et al. do not specifically teach the presence of at least four pluralities of base edge lengths forming the base of a geometric shape, wherein at least one of the base edge lengths of the first plurality is different from all the base edge lengths of each of the second, third, and fourth plurality of base edge lengths, at least one of the base edge lengths of the second plurality is different from all the base edge lengths of each of the first, third, and fourth plurality of base edge lengths, and at least one of the base edge lengths of the third plurality is different from all the base edge lengths of each of the first, second, and fourth plurality of base edge lengths (see claims 93 and 114).

Calhoun et al. do not specifically teach the presence of at least three rows of cavities each having a geometric shape including a base and a plurality of base edge lengths forming the base, wherein at least one of the base edge lengths of the first row of cavities is different from all the base edge lengths of each of the second and third row of cavities, and at least one of the base edge lengths of the second row of cavities is different from all the base edge lengths of each of

the first and third row of cavities (see claims 136 and 152).

Calhoun et al. do not specifically teach the presence of at least three cavities each of which has a geometric shape including a base and a plurality of base edge lengths forming the base, wherein at least one of the base edge lengths of the first plurality is different from all the base edge lengths of each of the second and third plurality of base edge lengths, and at least one of the base edge lengths of the second plurality is different from all the base edge lengths of each of the first and third plurality of base edge lengths (see claims 143 and 153).

Thus, Calhoun et al. do not teach each and every element of Applicants' claims. That is, there are claim elements recited in Applicants' independent claims missing from Calhoun et al. Thus, it is respectfully submitted that Calhoun et al. is not suitable for use in an anticipation rejection; rather, it is at most (if even that) suitable for an obviousness rejection.

Communication

Serial No.: Unassigned

Filed: Herewith

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

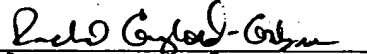
Page 13 of 13

CONCLUSION

The application should now be in condition for examination and notification to that effect is respectfully requested. The Examiner is invited to contact Applicants' Representatives, at the below-listed telephone number, if it is believed that prosecution of this application may be assisted thereby.

CERTIFICATE UNDER 37 C.F.R. §1.10:

The undersigned hereby certifies that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR §1.10 on the date indicated below and is addressed to the Assistant Commissioner for Patents, Attn: **Box Patent Application**, Washington, D.C. 20231.


Rachel Gayland-Gebhardt

"Express Mail" mailing label number:
EL888271625US

Date of Deposit: September 19, 2001

Date

Sept. 19, 2001

Respectfully submitted for

HOOPMAN et al.

By

Mueing, Raasch & Gebhardt, P.A.

P.O. Box 581415

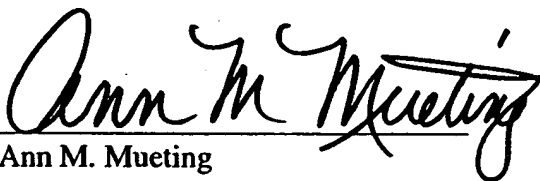
Minneapolis, MN 55458-1415

Telephone (612)305-1220

Facsimile (612)305-1228

Customer Number 26813

By:



Ann M. Mueing

Reg. No. 33,977

Direct Dial (612)305-1217

APPENDIX III

Serial No.: 09/955,604

Docket No.: 49933US032

**Office Action and Restriction Requirement mailed from the U.S. Patent and
Trademark Office on January 30, 2002.**



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/955,604	09/19/2001	Timothy L. Hoopman	49933US032	1214

7590 01/30/2002

Office of Intellectual Property Counsel
3M Innovative Properties Company
P.O. Box 33427
St. Paul, MN 55133-3427

EXAMINER

LEYSON, JOSEPH S

ART UNIT	PAPER NUMBER
----------	--------------

1722

DATE MAILED: 01/30/2002

4

Please find below and/or attached an Office communication concerning this application or proceeding.

in 2/1/02

Office Action Summary

Application No.

09/955,604

Applicant(s)

HOOPMAN ET AL

Examiner

Joseph Leyson

Art Unit

1722

-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 September 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 23,24,30-32,56,57,63,64,89,90,92,93,113,114 and 133-153 is/are pending in the application.
- 4a) Of the above claim(s) 56,57,63,64,113,114 and 149-153 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 23,24,30-32,89,90,92,93 and 133-148 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 6) ☐ Other:

Art Unit: 1722

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 23, 24, 30-32, 89, 90, 92, 93 and 133-148, drawn to a production tool, classified in class 425, subclass 470.

II. Claims 56, 57, 63, 64, 113, 114 and 149-153, drawn to a method of making a production tool, classified in class 264, subclass 219.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions II and I are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product as claimed can be made by another and materially different process such as a process which does not include creating a design wherein the production tool is made in a random fashion by cutting randomly or by randomly placing elements on a substrate.

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by

Art Unit: 1722

their different classification, restriction for examination purposes as indicated is proper.

4. During a telephone conversation with Ann Muetting on 16 January 2002 a provisional election was made with traverse to prosecute the invention of Group I, claims 23, 24, 30-32, 89, 90, 92, 93 and 133-148. Affirmation of this election must be made by applicant in replying to this Office action. Claims 56, 57, 63, 64, 113, 114 and 149-153 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

5. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

6. The disclosure is objected to because of the following informalities: The cross reference to the related applications on p. 1, lines 7-11, should be deleted in view of the cross reference inserted by the amendment in the transmittal papers filed on 19 September 2001.

Appropriate correction is required.

Art Unit: 1722

7. Claims 133, 137 and 144 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Claim 133 is redundant to claim 92 because if at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second and third plurality and if at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first and third plurality, then it is INHERENT that at least one of the base edge lengths of the third plurality is different from all the base edge lengths of the first and second plurality.

Claim 137 is redundant to claim 136 because if at least one of the base edge lengths of the first row is different from all of the base edge lengths of the second and third rows and if at least one of the base edge lengths of the second row is different from all of the base edge lengths of the first and third rows, then it is INHERENT that at least one of the base edge lengths of the third row is different from all the base edge lengths of the first and second rows.

Art Unit: 1722

Claim 144 is redundant to claim 143 because if at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second and third plurality and if at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first and third plurality, then it is INHERENT that at least one of the base edge lengths of the third plurality is different from all the base edge lengths of the first and second plurality.

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 23, 30, 31, 89, 92 and 133-148 are rejected under 35 U.S.C. 102(b) as being anticipated by Rochlis(-583).

Rochlis(-583) teaches a production tool suitable for use in manufacturing an abrasive article (col. 1, lines 50-56) which includes a plurality of cavities having different geometric shapes, angles and dimensions. The production tool can be a coating roll (fig. 19) or an etched (engraved) metal roll (col. 3, lines 52-63; col. 13, lines 15-17 and 62-67). The production

Art Unit: 1722

tool can have parallel rows of cavities as shown in figs. 21 and 22 with a first plurality of rectangular cavities, a second plurality of circular cavities, and a third plurality of triangular cavities. At least one of the angles or base edge lengths of the first plurality is different from all the angles or base edge lengths of the second plurality and of the third plurality. At least one of the angles or base edge lengths of the second plurality is different from all the angles or base edge lengths of the first plurality and of the third plurality. Rochlis(-583) discloses that the cavities of the production tool can have different sizes (col. 2, lines 66-70; col. 6, lines 17-22; col. 9, line 61, to col. 10, line 52; i.e., different heights). Rochlis(-583) discloses that the cavities and products can have pyramidal or truncated pyramidal shapes (i.e., figs. 10-13; col. 13, lines 51-58). Rochlis(-583) discloses that the production tool can have a plurality of different types (shapes) of cavities (col. 13, lines 29-35). Figs. 21 and 22 show a first row of cavities with a rectangular cross section which defines a first base edge length extending parallel to the first row and a second base edge length extending perpendicular to the first row, wherein the second base length of all the cavities in the first row is the same (of course they also can be different sizes as mentioned above), and show a first

Art Unit: 1722

rectangular cavity adjacent a second circular cavity, the second circular cavity being adjacent a third triangular cavity.

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this

Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary.

Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. Claims 23, 24, 31, 32, 89, 90, 92, 93 and 133-148 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rochlis(-583).

Art Unit: 1722

The 102 rejection above is based upon the interpretation of the alternatives for the production tool disclosed by Rochlis(-583) as being anticipatory. If applicants believe that the disclosed alternatives are NOT anticipatory, then it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify the production tool of Rochlis(-583) with the alternatives disclosed by Rochlis(-583) because Rochlis(-583) explicitly discloses that the production tool can be modified with such disclosed alternatives.

Rochlis(-583) discloses a production tool having 3 different types or shapes of cavities defining three pluralities or groups of cavities (figs. 21 and 22), but does NOT explicitly disclose a fourth plurality or group of cavities having a fourth different type of cavity. It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify the production tool to have four pluralities or group of cavities having four different types of cavity because Rochlis(-583) discloses that the production tool can have a plurality of different types of cavities and/or because Rochlis(-583: figs. 21 and 22) discloses a production tool example having not just two but three pluralities or groups of cavities having three different types of cavities. Note that different shapes will read on the respective instant claims.

Art Unit: 1722

For example, if the three different types had cross sections of a square, a pentagon, and a hexagon, then each of the cavities would have a boundary defined by at least four surfaces wherein adjacent planar surfaces of one cavity meet at an edge to define an angle of intersection therebetween, wherein the at least one angle of intersection of the first cavity is different from all the angles of the second and third cavities, and wherein at least one angle of intersection of the second cavity is different from all the angles of intersection of the first and third cavities. Various different types would also provide different base edge lengths.

12. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

13. Claims 23, 24, 30-32, 89, 90, 92, 93 and 133-148 are provisionally rejected under the judicially created doctrine of

Art Unit: 1722

obviousness-type double patenting as being unpatentable over claims 17, 20, 21, 25-28, 33-54, 94-96 and 98-111 of copending Application No. 09/520,032. Although the conflicting claims are not identical, they are not patentably distinct from each other because it would have been obvious to one of ordinary skill in the art at the time of the invention to eliminate the limitation of each cavity having a single opening of claims 17, 20, 21, 25-28, 33-54, 94-96 and 98-111 of copending Application No. 09/520,032 because it is well within the artisan of ordinary skill to make integral that which was separable or to make separable that which was integral. Generally there is no invention in making integral that which was before in several parts, In re Lockhart, 90 USPQ 214; In re Larson, 144 USPQ 347. The mere fact that a given structure is integral does not preclude its consisting of various elements, Howard v. Detroit Stove Works, 150 U.S. 164.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph Leyson whose telephone number is (703) 308-2647. The examiner can normally be reached on M-F(8:30-6:00) First Friday Off.

Art Unit: 1722

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (703) 308-3322. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

jl

jl

January 18, 2002



NAM NGUYEN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

Notice of References Cited	Application/Control No. 09/955,604		Applicant(s)/Patent Under Reexamination HOOPMAN ET AL.	
	Examiner Joseph Leyson		Art Unit 1722	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
	A	US-3312583	04-1967	Rochlis	-/-
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

APPENDIX IV

Serial No.: 09/955,604

Docket No.: 49933US032

Amendment and Response filed April 30, 2002..

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s):	Timothy L. HOOPMAN et al.)	Group Art Unit:	1722
)		
Serial No.:	09/955,604)	Examiner:	Joseph Leyson
Confirmation No.:	1214)		
)		
Filed:	19 September 2001)		
For:	TOOLS TO MANUFACTURE ABRASIVE ARTICLES			

AMENDMENT AND RESPONSE

Assistant Commissioner for Patents
Washington D.C. 20231

Dear Sir:

In response to the Office Action mailed 30 January 2002, please amend the above-identified application as follows:

In the Specification

Please replace the paragraph beginning at page 1, line 7, with the following rewritten paragraph. Per 37 C.F.R. § 1.121, this paragraph is also shown in Appendix A with notations to indicate the changes made.

-- This application is a continuation of Application No. 09/520,032 (filed March 6, 2000), pending, which is a division of Application No. 09/259,488 (filed February 26, 1999), issued as U.S. Patent NO. 6,076,248, which application is a division of Application No. 08/940,267 (filed September 29, 1997), issued as U.S. Patent No. 6,129,540, which is a continuation of Application No. 08/450,814 (filed May 25, 1995), abandoned, which is a division of Application No. 08/120,300 (filed September 13, 1993), abandoned. --

In the Claims

Please amend claims 23, 24, 30-32, 56, 57, 63, 64, 92, 93, 113, 114, 136, 143, and 151-153. The amended claims are provided below in clean form. Per 37 C.F.R. § 1.121, amended claims are also shown in Appendix A with notations to indicate changes made (for convenience, all pending claims are provided in Appendix A).

23. **(Amended)** A production tool suitable for use in manufacturing an abrasive article comprising a first, second, and third plurality of cavities, wherein the first plurality of cavities each have a first geometric shape and first plurality of angles forming the geometric shape, the second plurality of cavities each have a second geometric shape and second plurality of angles forming the geometric shape, and the third plurality of cavities each have a third geometric shape and third plurality of angles forming the geometric shape, wherein at least one of the angles of the first plurality is different from all of the angles of the second and third plurality of angles, wherein at least one of the angles of the second plurality is different from all of the angles of the first and third plurality of angles, and wherein each of the cavities has a single opening.

24. **(Amended)** A production tool suitable for use in manufacturing an abrasive article comprising a first, second, third, and fourth plurality of cavities, wherein the first plurality of cavities each have a first geometric shape and first plurality of angles forming the geometric shape, the second plurality of cavities each have a second geometric shape and second plurality of angles forming the geometric shape, the third plurality of cavities each have a third geometric shape and third plurality of angles forming the geometric shape, and the fourth plurality of cavities each have a fourth geometric shape and fourth plurality of angles forming the geometric shape, wherein at least one of the angles of the first plurality is different from all of the angles of the second, third, and fourth plurality of angles, wherein at least one of the angles of the second plurality is different from all of the angles of the first, third, and fourth plurality of angles, wherein at least one of the angles of

the third plurality is different from all of the angles of the first, second, and fourth plurality of angles, and wherein each of the cavities has a single opening.

30. **(Amended)** A production tool suitable for use in manufacturing an abrasive article comprising a plurality of cavities defining at least a first, a second, and a third group, wherein a first group of cavities has a first shape, a second group of cavities has a second shape, a third group of cavities has a third shape, wherein the first, second, and third shapes are all different, and wherein each of the cavities has a single opening.

31. **(Amended)** A production tool suitable for use in manufacturing an abrasive article comprising a plurality of cavities defining at least a first, a second, and a third group, wherein a first group of cavities has a first size, a second group of cavities has a second size, a third group of cavities has a third size, wherein the first, second, and third sizes are all different, and wherein each of the cavities has a single opening.

32. **(Amended)** A production tool suitable for use in manufacturing an abrasive article comprising a plurality of cavities defined by substantially distinct and discernible boundaries which include substantially specific dimensions, wherein a first cavity has specific first dimensions, a second cavity has specific second dimensions, and a third cavity has specific third dimensions, each of said cavities has a boundary defined by at least four planar surfaces wherein adjacent planar surfaces of one cavity meet at an edge to define an angle of intersection therebetween, wherein at least one angle of intersection of said first cavity is different from all the angles of intersection of said second and third cavities, wherein at least one angle of intersection of said second cavity is different from all the angles of intersection of said first and third cavities, and wherein each of the cavities has a single opening.

56. (Amended) A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a first, second, and third plurality of cavities, wherein the first plurality of cavities each have a first geometric shape and first plurality of angles forming the geometric shape, the second plurality of cavities each have a second geometric shape and second plurality of angles forming the geometric shape, and the third plurality of cavities each have a third geometric shape and third plurality of angles forming the geometric shape, wherein at least one of the angles of the first plurality is different from all of the angles of the second and third plurality of angles, wherein at least one of the angles of the second plurality is different from all of the angles of the first and third plurality of angles, and wherein each of the cavities has a single opening; and

forming the production tool using the design.

57. (Amended) A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a first, second, third, and fourth plurality of cavities, wherein the first plurality of cavities each have a first geometric shape and first plurality of angles forming the geometric shape, the second plurality of cavities each have a second geometric shape and second plurality of angles forming the geometric shape, the third plurality of cavities each have a third geometric shape and third plurality of angles forming the geometric shape, and the fourth plurality of cavities each have a fourth geometric shape and fourth plurality of angles forming the geometric shape, wherein at least one of the angles of the first plurality is different from all of the angles of the second, third, and fourth plurality of angles, wherein at least one of the angles of the second plurality is different from all of the angles of the first, third, and fourth plurality of angles, wherein at least one of the angles of the third plurality is different from all of the angles of the first, second, and fourth plurality of angles, and wherein each of the cavities has a single opening; and

forming the production tool using the design.

63. (Amended) A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a plurality of cavities defining at least a first, a second group, and a third group, wherein a first group of cavities has a first shape, a second group of cavities has a second shape, a third group of cavities has a third shape, wherein the first, second, and third shapes are all different, and wherein each of the cavities has a single opening; and

forming the production tool using the design.

64. (Amended) A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a plurality of cavities defining at least a first, a second group, and a third group, wherein a first group of cavities has a first size, a second group of cavities has a second size, a third group of cavities has a third size, wherein the first, second, and third sizes are all different, and wherein each of the cavities has a single opening; and

forming the production tool using the design.

92. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a first, second, and third plurality of cavities, wherein the first plurality of cavities each have a first geometric shape including a base and first plurality of base edge lengths forming the base of the geometric shape, the second plurality of cavities each have a second geometric shape including a base and second plurality of base edge lengths forming the base of the geometric shape, and the third plurality of cavities each have a third geometric shape including a base and third plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second and third plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first and third plurality of base edge lengths, and wherein each of the cavities has a single opening.

93. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a first, second, third, and fourth plurality of cavities, wherein the first plurality of cavities each have a first geometric shape including a base and first plurality of base edge lengths forming the base of the geometric shape, the second plurality of cavities each have a second geometric shape including a base and second plurality of base edge lengths forming the base of the geometric shape, the third plurality of cavities each have a third geometric shape including a base and third plurality of base edge lengths forming the base of the geometric shape, and the fourth plurality of cavities each have a fourth geometric shape including a base and fourth plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second, third, and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first, third, and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the third plurality is different from all of the base edge lengths of the first, second, and fourth plurality of base edge lengths, and wherein each of the cavities has a single opening.

113. (Amended) A method of making a production tool, the method comprising:
creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a first, second, and third plurality of cavities, wherein the first plurality of cavities each have a first geometric shape including a base and first plurality of base edge lengths forming the base of the geometric shape, the second plurality of cavities each have a second geometric shape including a base and second plurality of base edge lengths forming the base of the geometric shape, and the third plurality of cavities each have a third geometric shape including a base and third plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second and third plurality of base edge lengths, wherein at least one of the base edge lengths of the second

plurality is different from all of the base edge lengths of the first and third plurality of base edge lengths, and wherein each of the cavities has a single opening; and
forming the production tool using the design.

114. (Amended) A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a first, second, third, and fourth plurality of cavities, wherein the first plurality of cavities each have a first geometric shape including a base and first plurality of base edge lengths forming the base of the geometric shape, the second plurality of cavities each have a second geometric shape including a base and second plurality of base edge lengths forming the base of the geometric shape, the third plurality of cavities each have a third geometric shape including a base and third plurality of base edge lengths forming the base of the geometric shape, and the fourth plurality of cavities each have a fourth geometric shape including a base and fourth plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second, third, and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first, third, and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the third plurality is different from all of the base edge lengths of the first, second, and fourth plurality of base edge lengths, and wherein each of the cavities has a single opening; and

forming the production tool using the design.

136. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a first, second, and third row of cavities, wherein the cavities each have a geometric shape including a base and a plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first row of cavities is different from all the base edge lengths of the second and third rows of cavities, wherein at least one of the base edge lengths of

the second row of cavities is different from all the base edge lengths of the first and third row of cavities, and wherein each of the cavities has a single opening.

143. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising first, second, and third cavities, wherein the first cavity has a first geometric shape including a base and a first plurality of base edge lengths forming the base of the geometric shape, the second cavity has a second geometric shape including a base and a second plurality of base edge lengths forming the base of the geometric shape, and the third cavity has a third geometric shape including a base and a third plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality of base edge lengths is different from all the base edge lengths of the second and third plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality of base edge lengths is different from all the base edge lengths of the first and third plurality of base edge lengths, and wherein each of the cavities has a single opening.

151. (Amended) A method of making a production tool, the method comprising:
creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a plurality of cavities defined by substantially distinct and discernible boundaries which include substantially specific dimensions, wherein a first cavity has specific first dimensions, a second cavity has specific second dimensions, and a third cavity has specific third dimensions, each of said cavities has a boundary defined by at least four planar surfaces wherein adjacent planar surfaces of one cavity meet at an edge to define an angle of intersection therebetween, wherein at least one angle of intersection of said first cavity is different from all the angles of intersection of said second and third cavities, wherein at least one angle of intersection of said second cavity is different from all the angles of intersection of said first and third cavities, and wherein each of the cavities has a single opening; and

forming the production tool using the design.

152. (Amended) A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a first, second, and third row of cavities, wherein the cavities each have a geometric shape including a base and a plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first row of cavities is different from all the base edge lengths of the second and third rows of cavities, wherein at least one of the base edge lengths of the second row of cavities is different from all the base edge lengths of the first and third row of cavities, and wherein each of the cavities has a single opening; and

forming the production tool using the design.

153. (Amended) A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising first, second, and third cavities, wherein the first cavity has a first geometric shape including a base and a first plurality of base edge lengths forming the base of the geometric shape, the second cavity has a second geometric shape including a base and a second plurality of base edge lengths forming the base of the geometric shape, and the third cavity has a third geometric shape including a base and a third plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality of base edge lengths is different from all the base edge lengths of the second and third plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality of base edge lengths is different from all the base edge lengths of the first and third plurality of base edge lengths, and wherein each of the cavities has a single opening; and

forming the production tool using the design.

Amendment and Response

Timothy L. HOOPMAN et al.

Serial No.: 09/955,604

Confirm. No.: 1214

Filed: 19 September 2001

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

Page 10 of 12

Remarks

The Office Action mailed 30 January 2002 has been received and reviewed. Claims 23, 24, 30-32, 56, 57, 63, 64, 92, 93, 113, 114, 136, 143, and 151-153 have been amended. The pending claims are claims 23-24, 30-32, 56-57, 63-64, 89-90, 92-93, 113-114, and 133-153. Reconsideration and withdrawal of the rejections are respectfully requested.

Pursuant to the Examiner's request, the specification has been amended herein to correctly identify the cross reference information.

Response to Restriction Requirement

Pursuant to the telephone conversation between the Examiner and Applicants' Representative, Ann Muetting, election of Group I (claims 23, 24, 30-32, 89, 90, 92, 93, and 133-148) is hereby affirmed.

Applicants' Representatives reserve the right to pursue examination of the non-elected claims in continuation or divisional applications. Applicants respectfully request reconsideration of the restrictions in this case and submit that the inventions as claimed can be readily evaluated in one search without placing undue burden on the Examiner.

The 35 U.S.C. § 102(b) Rejection

Claims 23, 30-31, 89, 92, and 133-148 were rejected under 35 U.S.C. § 102(b) as being anticipated by Rochlis ('583). Applicants respectfully traverse this rejection.

Each of the independent claims recites that each of the cavities has a single opening. In contrast, the mold disclosed in Rochlis ('583) requires a laminate construction with multiple openings (i.e., one opening per layer). Specifically, these openings between the mating surfaces of the laminations allow that "air or gas evolved in the molding or hardening procedure may escape" (col. 13, lines 70-73). There is no enabling disclosure in Rochlis ('583), however, that any cavity, let alone each of the cavities, has a single opening. That is, there is no enabling

disclosure that Rochlis ('583) has laminated mold constructions without openings between the mating surfaces of the laminations.

For at least the above reasons, Applicants submit that claims 23, 30-31, 89, 92, and 133-148 are patentable over Rochlis ('583). Reconsideration and withdrawal of the rejection are, therefore, respectfully requested.

The 35 U.S.C. § 103(a) Rejection

Claims 23-24, 31-32, 89-90, 92-93, and 133-148 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Rochlis ('583). Applicants respectfully traverse this rejection.

Again, each of the independent claims recites that each of the cavities has a single opening. In contrast, the mold disclosed in Rochlis ('583) requires a laminate construction with multiple openings (i.e., one opening per layer). Specifically, these openings between the mating surfaces of the laminations allow that "air or gas evolved in the molding or hardening procedure may escape" (col. 13, lines 70-73). There is no enabling disclosure in Rochlis ('583), however, that any cavity, let alone each of the cavities, has a single opening. That is, there is no enabling disclosure that Rochlis ('583) has laminated mold constructions without openings between the mating surfaces of the laminations.

For at least the above reasons, claims 23-24, 31-32, 89-90, 92-93, and 133-148 are patentable over Rochlis ('583). Reconsideration and withdrawal of this rejection are, therefore, respectfully requested.

Double Patenting Rejection

Claims 23-24, 30-32, 89-90, 92-93, and 133-148 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 17, 20-21, 25-28, 33-54, 94-96, and 98-111 of copending Application No. 09/520,032. Upon an indication of otherwise allowable subject matter and in the event this rejection is maintained, Applicants will provide an appropriate response.

Amendment and Response

Timothy L. HOOPMAN et al.

Serial No.: 09/955,604

Confirm. No.: 1214

Filed: 19 September 2001

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

Page 12 of 12

Summary

It is respectfully submitted that the pending claims are in condition for allowance and notification to that effect is respectfully requested. The Examiner is invited to contact Applicants' Representatives, at the below-listed telephone number, if it is believed that prosecution of this application may be assisted thereby.

Respectfully submitted for
HOOPMAN et al.

By:

Mueeting, Raasch & Gebhardt, P.A.

P.O. Box 581415

Minneapolis, MN 55458-1415

Phone: (612) 305-1220

Facsimile: (612) 305-1228

By:

Ann M. Mueeting

Reg. No. 33,977

Direct Dial (612)305-1217

April 30, 2002
Date

AMM/kjm

CERTIFICATE UNDER 37 CFR §1.8:

The undersigned hereby certifies that this paper is being transmitted by facsimile in accordance with 37 CFR §1.6(d) to the Patent and Trademark Office, addressed to Assistant Commissioner for Patents, Washington, D.C. 20231, on this 30th day of APRIL, 2002, at 3:10pm (Central Time).

By:

Printed Name: Kelly J. McNulty

**APPENDIX A - SPECIFICATION/CLAIM AMENDMENTS INCLUDING NOTATIONS
TO INDICATE CHANGES MADE**

Serial No.: 09/955,604

Docket No.: 49933 US 032

Amendments to the following are indicated by underlining what has been added and bracketing what has been deleted. The amendments have also been shaded.

In the Specification

The paragraph beginning at page 1, line 7, has been replaced with the following paragraph:

This application is a continuation of Application No. 09/520,032 (filed March 11, 2000),
which is a continuation of Application No. 09/259,433 (filed February 26, 1999), which is a
continuation of U.S. Patent No. 6,076,248, which application is a division of Application No. 08/940,267 (filed
September 29, 1997), issued as U.S. Patent No. 6,129,510, which is a continuation of
Application No. 08/450,314 (filed May 25, 1995), abandoned, which is a division of Application
No. 08/120,306 (filed September 13, 1993), abandoned.

In the Claims

For convenience, all pending claims are shown below.

23. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a first, second, and third plurality of cavities, wherein the first plurality of cavities each have a first geometric shape and first plurality of angles forming the geometric shape, the second plurality of cavities each have a second geometric shape and second plurality of angles forming the geometric shape, and the third plurality of cavities each have a third geometric shape and third plurality of angles forming the geometric shape, wherein at least one of the angles of the first plurality is different from all of the angles of the second and third plurality of angles, [and] wherein at least one of the angles of the second plurality is different from all of the angles of the first and third plurality of angles, and wherein each of the cavities has a single opening.

Timothy L. HOOPMAN et al.

Serial No.: 09/955,604

Confirm. No.: 1214

Filed: 19 September 2001

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

24. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a first, second, third, and fourth plurality of cavities, wherein the first plurality of cavities each have a first geometric shape and first plurality of angles forming the geometric shape, the second plurality of cavities each have a second geometric shape and second plurality of angles forming the geometric shape, the third plurality of cavities each have a third geometric shape and third plurality of angles forming the geometric shape, and the fourth plurality of cavities each have a fourth geometric shape and fourth plurality of angles forming the geometric shape, wherein at least one of the angles of the first plurality is different from all of the angles of the second, third, and fourth plurality of angles, wherein at least one of the angles of the second plurality is different from all of the angles of the first, third, and fourth plurality of angles, [and] wherein at least one of the angles of the third plurality is different from all of the angles of the first, second, and fourth plurality of angles, and wherein each of the cavities has a single opening.

30. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a plurality of cavities defining at least a first, a second, and a third group, wherein a first group of cavities has a first shape, a second group of cavities has a second shape, a third group of cavities has a third shape, [and] wherein the first, second, and third shapes are all different, and wherein each of the cavities has a single opening.

31. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a plurality of cavities defining at least a first, a second, and a third group, wherein a first group of cavities has a first size, a second group of cavities has a second size, a third group of cavities has a third size, [and] wherein the first, second, and third sizes are all different, and wherein each of the cavities has a single opening.

Timothy L. HOOPMAN et al.

Serial No.: 09/955,604

Confirm. No.: 1214

Filed: 19 September 2001

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

32. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a plurality of cavities defined by substantially distinct and discernible boundaries which include substantially specific dimensions, wherein a first cavity has specific first dimensions, a second cavity has specific second dimensions, and a third cavity has specific third dimensions, each of said cavities has a boundary defined by at least four planar surfaces wherein adjacent planar surfaces of one cavity meet at an edge to define an angle of intersection therebetween, wherein at least one angle of intersection of said first cavity is different from all the angles of intersection of said second and third cavities, [and] wherein at least one angle of intersection of said second cavity is different from all the angles of intersection of said first and third cavities, ~~and wherein each of the cavities has a single opening.~~

56. (Amended) A method of making a production tool, the method comprising:
creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a first, second, and third plurality of cavities, wherein the first plurality of cavities each have a first geometric shape and first plurality of angles forming the geometric shape, the second plurality of cavities each have a second geometric shape and second plurality of angles forming the geometric shape, and the third plurality of cavities each have a third geometric shape and third plurality of angles forming the geometric shape, wherein at least one of the angles of the first plurality is different from all of the angles of the second and third plurality of angles, [and] wherein at least one of the angles of the second plurality is different from all of the angles of the first and third plurality of angles, ~~and wherein each of the cavities has a single opening;~~ and
forming the production tool using the design.

57. (Amended) A method of making a production tool, the method comprising:
creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a first, second, third, and fourth plurality of cavities, wherein the first plurality of

Timothy L. HOOPMAN et al.

Serial No.: 09/955,604

Confirm. No.: 1214

Filed: 19 September 2001

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

cavities each have a first geometric shape and first plurality of angles forming the geometric shape, the second plurality of cavities each have a second geometric shape and second plurality of angles forming the geometric shape, the third plurality of cavities each have a third geometric shape and third plurality of angles forming the geometric shape, and the fourth plurality of cavities each have a fourth geometric shape and fourth plurality of angles forming the geometric shape, wherein at least one of the angles of the first plurality is different from all of the angles of the second, third, and fourth plurality of angles, wherein at least one of the angles of the second plurality is different from all of the angles of the first, third, and fourth plurality of angles, [REDACTED] wherein at least one of the angles of the third plurality is different from all of the angles of the first, second, and fourth plurality of angles, and wherein each of the cavities has a single opening; and forming the production tool using the design.

63. (Amended) A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a plurality of cavities defining at least a first, a second group, and a third group, wherein a first group of cavities has a first shape, a second group of cavities has a second shape, a third group of cavities has a third shape, [REDACTED] wherein the first, second, and third shapes are all different, and wherein each of the cavities has a single opening; and forming the production tool using the design.

64. (Amended) A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a plurality of cavities defining at least a first, a second group, and a third group, wherein

Timothy L. HOOPMAN et al.

Serial No.: 09/955,604

Confirm. No.: 1214

Filed: 19 September 2001

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

a first group of cavities has a first size, a second group of cavities has a second size, a third group of cavities has a third size, [redacted] wherein the first, second, and third sizes are all different, and wherein each of the cavities has a single opening; and

forming the production tool using the design.

89. The production tool of claim 23, wherein the first geometric shape includes a base and first plurality of base edge lengths, wherein the second geometric shape includes a base and second plurality of base edge lengths, wherein the third geometric shape includes a base and third plurality of base edge lengths, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second and third plurality of base edge lengths, and wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first and third plurality of base edge lengths.

90. The production tool of claim 24, wherein the first geometric shape includes a base and first plurality of base edge lengths, wherein the second geometric shape includes a base and second plurality of base edge lengths, wherein the third geometric shape includes a base and third plurality of base edge lengths, wherein the fourth geometric shape includes a base and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second, third, and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first, third, and fourth plurality of base edge lengths, and wherein at least one of the base edge lengths of the third plurality is different from all of the base edge lengths of the first, second, and fourth plurality of base edge lengths.

92. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a first, second, and third plurality of cavities, wherein the first plurality of cavities each

Timothy L. HOOPMAN et al.

Serial No.: 09/955,604

Confirm. No.: 1214

Filed: 19 September 2001

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

have a first geometric shape including a base and first plurality of base edge lengths forming the base of the geometric shape, the second plurality of cavities each have a second geometric shape including a base and second plurality of base edge lengths forming the base of the geometric shape, and the third plurality of cavities each have a third geometric shape including a base and third plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second and third plurality of base edge lengths, [redacted] wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first and third plurality of base edge lengths, [redacted] and wherein each of the cavities has a single opening.

93. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a first, second, third, and fourth plurality of cavities, wherein the first plurality of cavities each have a first geometric shape including a base and first plurality of base edge lengths forming the base of the geometric shape, the second plurality of cavities each have a second geometric shape including a base and second plurality of base edge lengths forming the base of the geometric shape, the third plurality of cavities each have a third geometric shape including a base and third plurality of base edge lengths forming the base of the geometric shape, and the fourth plurality of cavities each have a fourth geometric shape including a base and fourth plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second, third, and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first, third, and fourth plurality of base edge lengths, [redacted] wherein at least one of the base edge lengths of the third plurality is different from all of the base edge lengths of the first, second, and fourth plurality of base edge lengths, [redacted] and wherein each of the cavities has a single opening.

Timothy L. HOOPMAN et al.

Serial No.: 09/955,604

Confirm. No.: 1214

Filed: 19 September 2001

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

113. (Amended) A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a first, second, and third plurality of cavities, wherein the first plurality of cavities each have a first geometric shape including a base and first plurality of base edge lengths forming the base of the geometric shape, the second plurality of cavities each have a second geometric shape including a base and second plurality of base edge lengths forming the base of the geometric shape, and the third plurality of cavities each have a third geometric shape including a base and third plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second and third plurality of base edge lengths, [REDACTED] wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first and third plurality of base edge lengths, and wherein each of the cavities has a single opening; and

forming the production tool using the design.

114. (Amended) A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a first, second, third, and fourth plurality of cavities, wherein the first plurality of cavities each have a first geometric shape including a base and first plurality of base edge lengths forming the base of the geometric shape, the second plurality of cavities each have a second geometric shape including a base and second plurality of base edge lengths forming the base of the geometric shape, the third plurality of cavities each have a third geometric shape including a base and third plurality of base edge lengths forming the base of the geometric shape, and the fourth plurality of cavities each have a fourth geometric shape including a base and fourth plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second, third, and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality is different from all

Timothy L. HOOPMAN et al.

Serial No.: 09/955,604

Confirm. No.: 1214

Filed: 19 September 2001

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

of the base edge lengths of the first, third, and fourth plurality of base edge lengths, [and] wherein at least one of the base edge lengths of the third plurality is different from all of the base edge lengths of the first, second, and fourth plurality of base edge lengths, and wherein each of the cavities has a single opening; and

forming the production tool using the design.

133. The production tool of claim 92, wherein at least one of the base edge lengths of the third plurality of base edge lengths is different from all the base edge lengths of the first and second plurality of base edge lengths.

134. The production tool of claim 92, wherein the first, second, and third geometric shapes are pyramidal.

135. The production tool of claim 92, wherein the first, second, and third geometric shapes are truncated pyramidal.

136. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a first, second, and third row of cavities, wherein the cavities each have a geometric shape including a base and a plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first row of cavities is different from all the base edge lengths of the second and third rows of cavities, [and] wherein at least one of the base edge lengths of the second row of cavities is different from all the base edge lengths of the first and third row of cavities, and wherein each of the cavities has a single opening.

137. The production tool of claim 136, wherein at least one of the base edge lengths of the third row of cavities is different from all the base edge lengths of the first and second row of cavities.

Timothy L. HOOPMAN et al.

Serial No.: 09/955,604

Confirm. No.: 1214

Filed: 19 September 2001

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

138. The production tool of claim 136, wherein the geometric shape of the cavities in the first, second, and third rows are pyramidal.

139. The production tool of claim 136, wherein the geometric shape of the cavities in the first, second, and third rows are truncated pyramidal.

140. The production tool of claim 136, wherein the first, second, and third rows of cavities extend in parallel to one another.

141. The production tool of claim 136, wherein the base edge lengths of the first row of cavities have a first base edge length extending parallel to the first row and a second base edge length extending perpendicular to the first row, and wherein the second base length of all the cavities in the first row is the same.

142. The production tool of claim 141, wherein at least some of the first base lengths of the cavities in the first row are different from one another.

143. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising first, second, and third cavities, wherein the first cavity has a first geometric shape including a base and a first plurality of base edge lengths forming the base of the geometric shape, the second cavity has a second geometric shape including a base and a second plurality of base edge lengths forming the base of the geometric shape, and the third cavity has a third geometric shape including a base and a third plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality of base edge lengths is different from all the base edge lengths of the second and third plurality of base edge lengths, [and] wherein at

Timothy L. HOOPMAN et al.

Serial No.: 09/955,604

Confirm. No.: 1214

Filed: 19 September 2001

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

least one of the base edge lengths of the second plurality of base edge lengths is different from all the base edge lengths of the first and third plurality of base edge lengths. ~~and wherein the~~

~~cavities are substantially open.~~

144. The production tool of claim 143, wherein at least one of the base edge lengths of the third plurality of base edge lengths is different from all the base edge lengths of the first and second plurality of base edge lengths.

145. The production tool of claim 143, wherein the geometric shapes of the first, second, and third cavities are pyramidal.

146. The production tool of claim 143, wherein the geometric shapes of the first, second, and third cavities are truncated pyramidal.

147. The production tool of claim 143, wherein the first cavity is located adjacent to the second cavity.

148. The production tool of claim 147, wherein the second cavity is located adjacent to the third cavity.

149. The method claim of 56, wherein the first geometric shape includes a base and first plurality of base edge lengths, wherein the second geometric shape includes a base and second plurality of base edge lengths, wherein the third geometric shape includes a base and third plurality of base edge lengths, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second and third plurality of base edge lengths, and wherein at least one of

Timothy L. HOOPMAN et al.

Serial No.: 09/955,604

Confirm. No.: 1214

Filed: 19 September 2001

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

the base edge lengths of the second plurality is different from all of the base edge lengths of the first and third plurality of base edge lengths.

150. The method claim of 57, wherein the first geometric shape includes a base and first plurality of base edge lengths, wherein the second geometric shape includes a base and second plurality of base edge lengths, wherein the third geometric shape includes a base and third plurality of base edge lengths, wherein the fourth geometric shape includes a base and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second, third, and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first, third, and fourth plurality of base edge lengths, and wherein at least one of the base edge lengths of the third plurality is different from all of the base edge lengths of the first, second, and fourth plurality of base edge lengths.

151. (Amended) A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a plurality of cavities defined by substantially distinct and discernible boundaries which include substantially specific dimensions, wherein a first cavity has specific first dimensions, a second cavity has specific second dimensions, and a third cavity has specific third dimensions, each of said cavities has a boundary defined by at least four planar surfaces wherein adjacent planar surfaces of one cavity meet at an edge to define an angle of intersection therebetween, wherein at least one angle of intersection of said first cavity is different from all the angles of intersection of said second and third cavities, [and] wherein at least one angle of intersection of said second cavity is different from all the angles of intersection of said first and third cavities, and wherein each of the cavities has a single opening; and

forming the production tool using the design.

Timothy L. HOOPMAN et al.

Serial No.: 09/955,604

Confirm. No.: 1214

Filed: 19 September 2001

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

152. (Amended) A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a first, second, and third row of cavities, wherein the cavities each have a geometric shape including a base and a plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first row of cavities is different from all the base edge lengths of the second and third rows of cavities, [and] wherein at least one of the base edge lengths of the second row of cavities is different from all the base edge lengths of the first and third row of cavities ~~and wherein each of the cavities has a single opening~~; and
forming the production tool using the design.

153. (Amended) A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising first, second, and third cavities, wherein the first cavity has a first geometric shape including a base and a first plurality of base edge lengths forming the base of the geometric shape, the second cavity has a second geometric shape including a base and a second plurality of base edge lengths forming the base of the geometric shape, and the third cavity has a third geometric shape including a base and a third plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality of base edge lengths is different from all the base edge lengths of the second and third plurality of base edge lengths, [and] wherein at least one of the base edge lengths of the second plurality of base edge lengths is different from all the base edge lengths of the first and third plurality of base edge lengths ~~and wherein each of the cavities has a single opening~~; and
forming the production tool using the design.

APPENDIX V

Serial No.: 09/955,604

Docket No.: 49933US032

**Office Action mailed from the United States Patent and Trademark Office on July
22, 2002.**



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/955,604	09/19/2001	Timothy L. Hoopman	49933US032	1214

7590

07/22/2002

Office of Intellectual Property Counsel
3M Innovative Properties Company
P.O. Box 33427
St. Paul, MN 55133-3427

EXAMINER

LEYSON, JOSEPH S

ART UNIT PAPER NUMBER

1722

6

DATE MAILED: 07/22/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

T-D

Office Action Summary	Applicati n No. 09/955,604	Applicant(s) HOOPMAN ET AL	
	Examiner Joseph Leyson	Art Unit 1722	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 April 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 23, 24, 30-32, 56, 57, 63, 64, 89, 90, 92, 93, 113, 114 and 133-153 is/are pending in the application.
- 4a) Of the above claim(s) 56, 57, 63, 64, 113, 114 and 149-153 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 23, 24, 30-32, 89, 90, 92, 93 and 133-148 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

Art Unit: 1722

1. Applicant's affirmation of the election with traverse of Group I, apparatus claims 23, 24, 30-32, 89, 90, 92, 93 and 133-148, in Paper No. 5 filed on 30 April 2002 is acknowledged. The traversal is on the ground(s) that the inventions as claimed can be readily evaluated in one search without undue burden on the Examiner. This is not found persuasive because the search and examination of both inventions would not be coextensive. The issues raised in the examination of apparatus claims are divergent from those raised in the examination of process claims. Further, while there may be some overlap in the searches of the two inventions, there is no reason to believe that the searches would be identical. Therefore, based on the additional work involved in searching and examining both distinct inventions together, restriction of the distinct inventions is clearly proper.

The requirement is still deemed proper and is therefore made FINAL.

2. This application contains claims 56, 57, 63, 64, 113, 114 and 149-153 drawn to an invention nonelected with traverse. A complete reply to the final rejection must include cancelation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

Art Unit: 1722

3. Claims 133, 137 and 144 are objected to under 37

CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Claim 133 is redundant to claim 92 because if at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second and third plurality and if at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first and third plurality, then it is INHERENT that at least one of the base edge lengths of the third plurality is different from all the base edge lengths of the first and second plurality.

Claim 137 is redundant to claim 136 because if at least one of the base edge lengths of the first row is different from all of the base edge lengths of the second and third rows and if at least one of the base edge lengths of the second row is different from all of the base edge lengths of the first and third rows, then it is INHERENT that at least one of the base edge lengths of the third row is different from all the base edge lengths of the first and second rows.

Art Unit: 1722

Claim 144 is redundant to claim 143 because if at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second and third plurality and if at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first and third plurality, then it is INHERENT that at least one of the base edge lengths of the third plurality is different from all the base edge lengths of the first and second plurality.

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 23, 30, 31, 89, 92 and 133-148 are rejected under 35 U.S.C. 102(b) as being anticipated by Rochlis(-583).

Rochlis(-583) teaches a production tool suitable for use in manufacturing an abrasive article (col. 1, lines 50-56) which includes a plurality of cavities having different geometric shapes, angles and dimensions. The production tool can be a coating roll (fig. 19) or an etched (engraved) metal roll (col. 3, lines 52-63; col. 13, lines 15-17 and 62-67). The production

Art Unit: 1722

tool can have parallel rows of cavities as shown in figs. 21 and 22 with a first plurality of rectangular cavities, a second plurality of circular cavities, and a third plurality of triangular cavities. At least one of the angles or base edge lengths of the first plurality is different from all the angles or base edge lengths of the second plurality and of the third plurality. At least one of the angles or base edge lengths of the second plurality is different from all the angles or base edge lengths of the first plurality and of the third plurality. Rochlis(-583) discloses that the cavities of the production tool can have different sizes (col. 2, lines 66-70; col. 6, lines 17-22; col. 9, line 61, to col. 10, line 52; i.e., different heights). Rochlis(-583) discloses that the cavities and products can have pyramidal or truncated pyramidal shapes (i.e., figs. 10-13; col. 13, lines 51-58). Rochlis(-583) discloses that the production tool can have a plurality of different types (shapes) of cavities (col. 13, lines 29-35). Figs. 21 and 22 show a first row of cavities with a rectangular cross section which defines a first base edge length extending parallel to the first row and a second base edge length extending perpendicular to the first row, wherein the second base length of all the cavities in the first row is the same (of course they also can be different sizes as mentioned above), and show a first

Art Unit: 1722

rectangular cavity adjacent a second circular cavity, the second circular cavity being adjacent a third triangular cavity. Each of the cavities has a single opening.

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this

Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary.

Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Art Unit: 1722

7. Claims 23, 24, 31, 32, 89, 90, 92, 93 and 133-148 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rochlis(-583).

The 102 rejection above is based upon the interpretation of the alternatives for the production tool disclosed by Rochlis(-583) as being anticipatory. If applicants believe that the disclosed alternatives are NOT anticipatory, then it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify the production tool of Rochlis(-583) with the alternatives disclosed by Rochlis(-583) because Rochlis(-583) explicitly discloses that the production tool can be modified with such disclosed alternatives.

Rochlis(-583) discloses a production tool, as mentioned above, having 3 different types or shapes of cavities defining three pluralities or groups of cavities (figs. 21 and 22), but does NOT explicitly disclose a fourth plurality or group of cavities having a fourth different type of cavity. It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify the production tool to have four pluralities or group of cavities having four different types of cavity because Rochlis(-583) discloses that the production tool can have a plurality of different types of cavities and/or because Rochlis(-583: figs. 21 and 22) discloses

Art Unit: 1722

a production tool example having not just two but three pluralities or groups of cavities having three different types of cavities. Note that different shapes will read on the respective instant claims. For example, if the three different types had cross sections of a square, a pentagon, and a hexagon, then each of the cavities would have a boundary defined by at least four surfaces wherein adjacent planar surfaces of one cavity meet at an edge to define an angle of intersection therebetween, wherein the at least one angle of intersection of the first cavity is different from all the angles of the second and third cavities, and wherein at least one angle of intersection of the second cavity is different from all the angles of intersection of the first and third cavities. Various different types would also provide different base edge lengths.

8. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Art Unit: 1722

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

9. Claims 23, 24, 30-32, 89, 90, 92, 93 and 133-148 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 17, 20, 21, 25-28, 33-54, 94-96 and 98-111 of copending Application No. 09/520,032 in view of Rochlis(-583). Claims 17, 20, 21, 25-28, 33-54, 94-96 and 98-111 of copending Application No. 09/520,032 disclose the production tool substantially as instantly claimed. Rochlis(-583) discloses a production tool as mentioned above. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify the production tool of claims 17, 20, 21, 25-28, 33-54, 94-96 and 98-111 of copending Application No. 09/520,032 such that the cavities have a first, second, third, or more plurality of cavities, each plurality having a different shape because such a modification would produce a product having a first, second, third, or more plurality of different shapes on the product as disclosed by Rochlis(-583). Note that the possible different shapes and combinations thereof disclosed by Rochlis(-583) would provide the dimensions, planar surfaces, angles, edges, boundaries and shapes as recited by the instant claims.

Art Unit: 1722

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

10. Applicant's arguments with respect to the instant claims have been considered but are moot in view of the new ground(s) of rejection.

Applicants argue that Rochlis(-583) does not disclose each cavity having a single opening. The examiner respectfully disagrees. The examiner does agree that the mold disclosed by Rochlis(-583) in figs. 21 and 22 is a laminate construction and that each layer has multiple openings. The multiple openings of each layer correspond to the multiple cavities. And, when the layers are assembled to form the mold, corresponding multiple openings define a single cavity having a single opening. Thus, the layers separately have multiple openings, whereas a single cavity has a single opening. If there are any openings between the layers, they are used for venting. These vent openings are part of the mold, and are NOT part of the mold cavity.

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

Art Unit: 1722

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph Leyson whose telephone number is (703) 308-2647. The examiner can normally be reached on M-F(8:30-6:00) First Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jan Silbaugh can be reached on (703) 308-3829. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Application/Control Number: 09/955,604

Page 12

Art Unit: 1722

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

jl

jl

July 18, 2002

[Signature]

IAN H. SILBAUGH
SUPERVISORY PATENT EXAMINER
ART UNIT 1722

07/18/02

APPENDIX VI

Serial No.: 09/955,604

Docket No.: 49933US032

Amendment and Response Under 37 C.F.R. 1.116 transmitted on September 23,
2002 via facsimile transmission.

OFFICIAL
Expedited Examining Procedure
Group 1722

PATENT
Docket No. 49933US032

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Timothy L. HOOPMAN et al.)	Group Art Unit: 1722
Serial No.: 09/955,604)	
Confirmation No.: 1214)	Examiner: Joseph S. Leyson
Filed: 19 September 2001)	
For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES .	

AMENDMENT AND RESPONSE UNDER 37 CFR §1.116

Assistant Commissioner for Patents
Attn: **BOX AF**
Washington D.C. 20231

Dear Sir:

In response to the Final Office Action mailed 22 July 2002, please amend the above-identified application as follows:

In the Claims

Please cancel claims 56, 57, 63, 64, 113, 114, 133, 137, 144, and 149-153.

Serial No.: 09/955,604

Confirmation No.: 1214

Filed: 19 September 2001

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

Remarks

The Final Office Action mailed 22 July 2002 has been received and reviewed. Claims 56, 57, 63, 64, 113, 114, 133, 137, 144, and 149-153 having been cancelled, the pending claims are claims 23, 24, 30-32, 89, 90, 92, 93, 134-136, 138-143, and 145-148.

Reconsideration and withdrawal of the rejections in view of the cancellation of the claims above-indicated and the following comments are respectfully requested.

Obviousness-Type Double Patenting Rejection

Claims 23, 24, 30-32, 89-90, 92, 93 and 133-148 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 17, 20, 21, 25-28, 33-54, 94-96 and 98-111 of co-pending application No. 09/520,032 in view of Rochlis (U.S. Patent No. 3,312,583). The cancellation of claims 133, 137, and 144 renders the rejection as to these claims moot. As to the remaining claims, upon an indication of otherwise allowable subject matter and in the event this rejection is maintained, Applicants will provide an appropriate response.

The 37 U.S.C. §1.75 Objection

The Examiner objected to claims 133, 137, and 144 under 37 U.S.C. §1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim.

Applicants do not agree that claims 133, 137, and 144 are of improper dependent form. However, in the interest of furthering prosecution of the application, these claims have been cancelled.

Withdrawal of the objection is respectfully requested.

Serial No.: 09/955,604

Confirmation No.: 1214

Filed: 19 September 2001

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

The 35 U.S.C. §102 Rejection

The Examiner rejected claims 23, 30, 31, 89, 92, and 133-148 under 35 U.S.C. §102(b) as being anticipated by Rochlis (U.S. Patent No. 3,312,583).

Applicants submit that the cancellation of claims 133, 137, and 144 renders the rejection as to these claims moot. As to claims 23, 30, 31, 89, 92, 134-136, 138-143, and 145-148, Applicants respectfully traverse this rejection.

Applicants' invention is directed to a production tool for manufacturing an abrasive article. The production tool includes a plurality of cavities, each of which has a single opening. Various embodiments of the production tool are claimed.

Claims 23, 30, 31, 89, 92, 134-136, 138-143, and 145-148 are not anticipated under 35 U.S.C. § 102(b) by Rochlis '583.

The standard for anticipation is one of strict identity. "It is axiomatic that for prior art to anticipate under § 102 it has to meet every element of the claimed invention"

Hybritech Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 231 U.S.P.Q. 81, 90 (Fed. Cir. 1986), cert. denied, 480 U.S. 947 (1987).

"In determining that quantum of prior art disclosure which is necessary to declare an applicant's invention 'not novel' or 'anticipated' within section 102, the stated test is whether a reference contains an 'enabling disclosure'" In re Hoeksema, 399 F.2d 269, 158 U.S.P.Q. 596, 600 (CCPA 1968). "A reference contains an 'enabling disclosure' if the public was in possession of the claimed invention before the date of invention." M.P.E.P. § 2121.01.

1. Rochlis '583 does not disclose every element of the claimed invention.

Each of Applicants' independent claims recites a production tool for manufacturing an abrasive article having a plurality of cavities, each of which has a single

opening. In contrast, the mold disclosed in Rochlis '583 requires a laminate construction with multiple openings (i.e., openings between the layers in addition to the opening through which mold material enters the cavity) (col. 3, lines 40-49). Specifically, these openings between the mating surfaces of the laminations allow that "air or gas evolved in the molding or hardening procedure may escape" (col. 13, lines 70-73). There is no disclosure in Rochlis '583, however, that any cavity, let alone each of the cavities, has only a single opening. That is, there is no disclosure that Rochlis '583 has laminated mold constructions without openings between the mating surfaces of the laminations. Furthermore, there is no disclosure that Rochlis '583 has mold constructions with a single opening in each cavity.

Applicants also traverse the assertion that the vent openings are not part of the mold cavities. Rochlis '583 clearly states that the vent openings are provided to prevent entrapment of gas "in the mold cavity in a manner to possibly alter the shape or size of the pile elements" (column 3, lines 47-48). In other words, the vent openings allow gas to escape from the cavities to allow them to fill properly. As a result, any assertion that the vent openings are not located in the cavities is simply not supported by Rochlis '583 and must be withdrawn.

2. Rochlis '583 does not contain an enabling disclosure.

As stated above, Rochlis '583 does not disclose a production tool with any cavity, let alone each of a plurality of cavities, having only a single opening. Furthermore, Rochlis '583 does not teach how one of skill in the art would make a production tool for manufacturing an abrasive article with even one cavity having a single opening. Rochlis '583 is enabling for a laminated mold construction that includes openings between the mating surfaces of the laminations. There is no enabling disclosure in Rochlis '583 of how one of skill in the art would make a mold or production tool with only a single opening.

The 35 U.S.C. §103 Rejection

The Examiner rejected claims 23, 24, 31, 32, 89, 90, 92, 93, and 133-148 under 35 U.S.C. §103(a) as being unpatentable over Rochlis (U.S. Patent No. 3,312,583).

Applicants submit that the cancellation of claims 133, 137, and 144 renders the rejection as to these claims moot. As to claims 23, 24, 31, 32, 89, 90, 92, 93, 134-136, 138-143, and 145-148, Applicants respectfully traverse this rejection.

Claims 23, 24, 31, 32, 89, 90, 92, 93, 134-136, 138-143, and 145-148 are not obvious under 35 U.S.C. § 103 over Rochlis '583.

"When applying 35 U.S.C. § 103, the following tenets of patent law must be adhered to:

- (A) The claimed invention must be considered as a whole;
- (B) The references must be considered as a whole and must suggest the desirability and thus the obviousness of making the combination;
- (C) The references must be viewed without the benefit of impermissible hindsight vision afforded by the claimed invention; and
- (D) Reasonable expectation of success is the standard with which obviousness is determined." M.P.E.P. § 2141 (citations omitted).

1. Rochlis '583 does not teach or suggest the claimed invention.

Rochlis '583 does not explicitly teach or suggest a production tool with any cavity having only a single opening, let alone each of a plurality of cavities having only a single opening. Furthermore, Rochlis '583 does not explicitly teach or suggest how one of skill in the art would make a production tool for manufacturing an abrasive article with a cavity having a single opening in each cavity. Rochlis '583 teaches how to make a laminated mold construction with openings between the mating surfaces of the laminations. From the disclosure of Rochlis '583, one of skill in the art would not know how to make a mold with only a single opening in each cavity.

Applicants also submit that the Office Action fails to establish a prima facie case of obviousness as no motivation is identified as to why one of skill in the art would modify the teachings of Rochlis '583 to reach the claimed invention.

2. When considered as a whole, Rochlis '583 teaches away from the claimed invention.

"It is impermissible within the framework of section 103 to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art." In re Wesslau, 353 F.2d 238, 147 U.S.P.Q. 391, 393 (CCPA 1965). A single statement in the prior art reference should not be taken out of context and relied upon with the benefit of hindsight to show obviousness; rather, a reference should be considered as a whole. Bausch & Lomb, Inc. v. Barnes-Hind/Hycrocurve, Inc., 796 F.2d 443, 230 U.S.P.Q. 416, 419-420 (Fed. Cir. 1986), cert. denied, 484 U.S. 823 (1987), on remand, 10 U.S.P.Q. 2d 1929 (N.D. Calif. 1989).

One of skill in the art would not be motivated to make a mold or production tool for manufacturing an abrasive article with a single opening as a result of the teachings of Rochlis '583. In fact, one of skill in the art would expect that a mold with only a single opening in each cavity would not be functional since the openings between the mating surfaces of the laminations allow that "air or gas evolved in the molding or hardening procedure may escape" (col. 13, lines 70-73). In effect, Rochlis '583 teaches away from Applicants' invention when its disclosure is considered as a whole.

3. It is impermissible to use hindsight as an obviousness test.

Applicants respectfully submit that the use of Rochlis '583 alone in an obviousness rejection can only occur by the impermissible use of hindsight reasoning. In order

Serial No.: 09/955,604

Confirmation No.: 1214

Filed: 19 September 2001

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

to establish a *prima facie* case of obviousness, the references must teach or suggest all the claim limitations. Hybritech Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 231 U.S.P.Q. 81 at 93 ("Focusing on the obviousness of substitutions and differences instead of on the invention as a whole, . . . was a legally improper way to simplify the difficult determination of obviousness."). One cannot "simply [to] engage in a hindsight reconstruction of the claimed invention, using the Applicant's structure as a template and selecting elements from references to fill the gaps." In re Gorman, 933 F.2d 982, 18 U.S.P.Q.2d 1885, 1888 (Fed. Cir. 1991). Further, both the suggestion for combining the teachings of the prior art to make the invention and the reasonable likelihood of its success must be founded in the prior art and not in the teachings of Applicants' disclosure. In re Dow Chem., 837 F.2d 469, 473, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988). Here, the cited art neither suggests the combination of its teachings nor suggests the reasonable likelihood that such a combination would result in the present invention.

Applicants respectfully submit that the teachings of Rochlis '583 are woefully inadequate to teach or suggest any mold or production tool for manufacturing an abrasive article, wherein the tool has a plurality of cavities, each of which as a single opening. Impermissible hindsight was used to sift through the prior art in order to reconstruct the claimed invention using Applicants' specification as a template for selecting a particular teaching.

Furthermore, there is simply no teaching, suggestion, or incentive in Rochlis '583 to provide a motivation to modify its teachings to provide a mold or tool with cavities having only single openings, specifically in view of the fact that Rochlis '583 emphasizes the importance of the openings between the mating surfaces of the laminations (they allow for air or gas to be evolved in the molding or hardening procedure, col. 13, lines 70-73).

Serial No.: 09/955,604

Confirmation No.: 1214

Filed: 19 September 2001

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

Summary

For the many foregoing reasons, it is respectfully submitted that the pending claims 23, 24, 30-32, 89, 90, 92, 93, 134-136, 138-143, and 145-148 are in condition for allowance and notification to that effect is respectfully requested.

The Examiner is invited to contact Applicants' Representatives, at the below-listed telephone number, if it is believed that prosecution of this application may be assisted thereby.

Respectfully submitted for
HOOPMAN et al.

By

Mueting, Raasch & Gebhardt, P.A.

P.O. Box 581415

Minneapolis, MN 55458-1415

Phone: (612) 305-1220

Facsimile: (612) 305-1228

Customer Number 26813



26813

PATENT TRADEMARK OFFICE

23 SEPT. 2002

Date

By: 


Kevin W. Raasch

Reg. No. 35,651

Direct Dial (612)305-1217

CERTIFICATE UNDER 37 CFR §1.8:

The undersigned hereby certifies that this paper is being transmitted by facsimile in accordance with 37 CFR §1.6(d) to the Patent and Trademark Office, addressed to Assistant Commissioner for Patents, Attn: Box AF, Washington, D.C. 20231, on this 23rd day of September, 2002, at 3:57 p.m. (Central Time).

By: 

Name: Rachel Gayle Gubert

**APPENDIX A - SPECIFICATION/CLAIM AMENDMENTS INCLUDING NOTATIONS
TO INDICATE CHANGES MADE**

Serial No.: 09/955,604

Docket No.: 49933 US 032

Amendments to the following are indicated by underlining what has been added and bracketing what has been deleted. The amendments have also been marked in bold typeface.

In the Claims

For convenience, all pending claims are shown below.

23. A production tool suitable for use in manufacturing an abrasive article comprising a first, second, and third plurality of cavities, wherein the first plurality of cavities each have a first geometric shape and first plurality of angles forming the geometric shape, the second plurality of cavities each have a second geometric shape and second plurality of angles forming the geometric shape, and the third plurality of cavities each have a third geometric shape and third plurality of angles forming the geometric shape, wherein at least one of the angles of the first plurality is different from all of the angles of the second and third plurality of angles, wherein at least one of the angles of the second plurality is different from all of the angles of the first and third plurality of angles, and wherein each of the cavities has a single opening.

24. A production tool suitable for use in manufacturing an abrasive article comprising a first, second, third, and fourth plurality of cavities, wherein the first plurality of cavities each have a first geometric shape and first plurality of angles forming the geometric shape, the second plurality of cavities each have a second geometric shape and second plurality of angles forming the geometric shape, the third plurality of cavities each have a third geometric shape and third plurality of angles forming the geometric shape, and the fourth plurality of cavities each have a fourth geometric shape and fourth plurality of angles forming the geometric shape, wherein at least one of the angles of the first plurality is different from all of the angles of the second, third, and fourth plurality of angles, wherein at least one of the angles of the second plurality is different from all of the angles of the first, third, and fourth plurality of angles, wherein at least one of the angles of the third plurality is

different from all of the angles of the first, second, and fourth plurality of angles, and wherein each of the cavities has a single opening.

30. A production tool suitable for use in manufacturing an abrasive article comprising a plurality of cavities defining at least a first, a second, and a third group, wherein a first group of cavities has a first shape, a second group of cavities has a second shape, a third group of cavities has a third shape, wherein the first, second, and third shapes are all different, and wherein each of the cavities has a single opening.

31. A production tool suitable for use in manufacturing an abrasive article comprising a plurality of cavities defining at least a first, a second, and a third group, wherein a first group of cavities has a first size, a second group of cavities has a second size, a third group of cavities has a third size, wherein the first, second, and third sizes are all different, and wherein each of the cavities has a single opening.

32. A production tool suitable for use in manufacturing an abrasive article comprising a plurality of cavities defined by substantially distinct and discernible boundaries which include substantially specific dimensions, wherein a first cavity has specific first dimensions, a second cavity has specific second dimensions, and a third cavity has specific third dimensions, each of said cavities has a boundary defined by at least four planar surfaces wherein adjacent planar surfaces of one cavity meet at an edge to define an angle of intersection therebetween, wherein at least one angle of intersection of said first cavity is different from all the angles of intersection of said second and third cavities, wherein at least one angle of intersection of said second cavity is different from all the angles of intersection of said first and third cavities, and wherein each of the cavities has a single opening.

56. —Cancelled—

57. Cancelled

63. Cancelled

64. Cancelled

89. The production tool of claim 23, wherein the first geometric shape includes a base and first plurality of base edge lengths, wherein the second geometric shape includes a base and second plurality of base edge lengths, wherein the third geometric shape includes a base and third plurality of base edge lengths, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second and third plurality of base edge lengths, and wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first and third plurality of base edge lengths.

90. The production tool of claim 24, wherein the first geometric shape includes a base and first plurality of base edge lengths, wherein the second geometric shape includes a base and second plurality of base edge lengths, wherein the third geometric shape includes a base and third plurality of base edge lengths, wherein the fourth geometric shape includes a base and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second, third, and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first, third, and fourth plurality of base edge lengths, and wherein at least one of the base edge lengths of the third plurality is different from all of the base edge lengths of the first, second, and fourth plurality of base edge lengths.

92. A production tool suitable for use in manufacturing an abrasive article comprising a first, second, and third plurality of cavities, wherein the first plurality of cavities each have a first geometric shape including a base and first plurality of base edge lengths forming the base of the geometric shape, the second plurality of cavities each have a second geometric shape including a

base and second plurality of base edge lengths forming the base of the geometric shape, and the third plurality of cavities each have a third geometric shape including a base and third plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second and third plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first and third plurality of base edge lengths, and wherein each of the cavities has a single opening.

93. A production tool suitable for use in manufacturing an abrasive article comprising a first, second, third, and fourth plurality of cavities, wherein the first plurality of cavities each have a first geometric shape including a base and first plurality of base edge lengths forming the base of the geometric shape, the second plurality of cavities each have a second geometric shape including a base and second plurality of base edge lengths forming the base of the geometric shape, the third plurality of cavities each have a third geometric shape including a base and third plurality of base edge lengths forming the base of the geometric shape, and the fourth plurality of cavities each have a fourth geometric shape including a base and fourth plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second, third, and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first, third, and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the third plurality is different from all of the base edge lengths of the first, second, and fourth plurality of base edge lengths, and wherein each of the cavities has a single opening.

113. Cancelled

114. Cancelled

133. Cancelled

134. The production tool of claim 92, wherein the first, second, and third geometric shapes are pyramidal.

135. The production tool of claim 92, wherein the first, second, and third geometric shapes are truncated pyramidal.

136. A production tool suitable for use in manufacturing an abrasive article comprising a first, second, and third row of cavities, wherein the cavities each have a geometric shape including a base and a plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first row of cavities is different from all the base edge lengths of the second and third rows of cavities, wherein at least one of the base edge lengths of the second row of cavities is different from all the base edge lengths of the first and third row of cavities, and wherein each of the cavities has a single opening.

137. Cancelled

138. The production tool of claim 136, wherein the geometric shape of the cavities in the first, second, and third rows are pyramidal.

139. The production tool of claim 136, wherein the geometric shape of the cavities in the first, second, and third rows are truncated pyramidal.

140. The production tool of claim 136, wherein the first, second, and third rows of cavities extend in parallel to one another.

141. The production tool of claim 136, wherein the base edge lengths of the first row of cavities have a first base edge length extending parallel to the first row and a second base edge length extending perpendicular to the first row, and wherein the second base length of all the cavities in the first row is the same.

142. The production tool of claim 141, wherein at least some of the first base lengths of the cavities in the first row are different from one another.

143. A production tool suitable for use in manufacturing an abrasive article comprising first, second, and third cavities, wherein the first cavity has a first geometric shape including a base and a first plurality of base edge lengths forming the base of the geometric shape, the second cavity has a second geometric shape including a base and a second plurality of base edge lengths forming the base of the geometric shape, and the third cavity has a third geometric shape including a base and a third plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality of base edge lengths is different from all the base edge lengths of the second and third plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality of base edge lengths is different from all the base edge lengths of the first and third plurality of base edge lengths, and wherein each of the cavities has a single opening.

144. Cancelled

145. The production tool of claim 143, wherein the geometric shapes of the first, second, and third cavities are pyramidal.

146. The production tool of claim 143, wherein the geometric shapes of the first, second, and third cavities are truncated pyramidal.

Serial No.: 09/955,604

Confirmation No.: 1214

Filed: 19 September 2001

For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

147. The production tool of claim 143, wherein the first cavity is located adjacent to the second cavity.

148. The production tool of claim 147, wherein the second cavity is located adjacent to the third cavity.

149. Cancelled

150. Cancelled

151. Cancelled

152. Cancelled

153. Cancelled

APPENDIX VII

Serial No.: 09/955,064

Docket No.: 49933US032

**Advisory Action mailed from the U.S. Patent and Trademark Office on October 4,
2002.**



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20530
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/955,604	09/19/2001	Timothy L. Hoopman	49933US032	1214

7590

10/04/2002

Office of Intellectual Property Counsel
3M Innovative Properties Company
P.O. Box 33427
St. Paul, MN 55133-3427

EXAMINER

LEYSON, JOSEPH S

ART UNIT

PAPER NUMBER

1722

DATE MAILED: 10/04/2002

8

Please find below and/or attached an Office communication concerning this application or proceeding.

Advisory Action

Application No.

09/955,604

Applicant(s)

HOOPMAN ET AL.

Examiner

Joseph Layson

Art Unit

1722

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 23 September 2002 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE. Therefore, further action by the applicant is required to avoid abandonment of this application. A proper reply to a final rejection under 37 CFR 1.113 may only be either: (1) a timely filed amendment which places the application in condition for allowance; (2) a timely filed Notice of Appeal (with appeal fee); or (3) a timely filed Request for Continued Examination (RCE) in compliance with 37 CFR 1.114.

PERIOD FOR REPLY (check either a) or b))

- a) ☐ The period for reply expires _____ months from the mailing date of the final rejection.
- b) ☒ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection. ONLY CHECK THIS BOX WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 708.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

1. ☐ A Notice of Appeal was filed on _____. Appellant's Brief must be filed within the period set forth in 37 CFR 1.192(a), or any extension thereof (37 CFR 1.191(d)), to avoid dismissal of the appeal.
2. ☐ The proposed amendment(s) will not be entered because:
- (a) ☐ they raise new issues that would require further consideration and/or search (see NOTE below);
 - (b) ☐ they raise the issue of new matter (see Note below);
 - (c) ☐ they are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
 - (d) ☐ they present additional claims without canceling a corresponding number of finally rejected claims.

NOTE: _____

3. ☒ Applicant's reply has overcome the following rejection(s): all the rejections to canceled claims 133, 137 and 144.
4. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
5. ☒ The a) ☐ affidavit, b) ☐ exhibit, or c) ☒ request for reconsideration has been considered but does NOT place the application in condition for allowance because: see attached.
6. ☐ The affidavit or exhibit will NOT be considered because it is not directed SOLELY to issues which were newly raised by the Examiner in the final rejection.
7. ☒ For purposes of Appeal, the proposed amendment(s) a) ☐ will not be entered or b) ☒ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.

The status of the claim(s) is (or will be) as follows:

Claim(s) allowed: _____

Claim(s) objected to: _____

Claim(s) rejected: 23,24,30-32,89,90,92,93,134-136,138-143 and 145-148.

Claim(s) withdrawn from consideration: _____

8. ☐ The proposed drawing correction filed on _____ is a) ☐ approved or b) ☐ disapproved by the Examiner.
9. ☐ Note the attached Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____
10. ☐ Other: _____

Attachment

Art Unit: 1722

1. The request for reconsideration has been considered but does not place this application in condition for allowance because the arguments filed on 23 September 2002 are not persuasive.

Applicant argues that each cavity having a single opening as disclosed the instant claims is not disclosed by the prior art and that Rochlis (-583) discloses a mold with a laminate construction with multiple openings including openings between layers of the laminate mold which are vent openings to allow air or gas to escape. The examiner agrees that Rochlis (-583) discloses a mold with a laminate construction with multiple openings. However, applicants do NOT preclude these openings in the instant claims. Note that the instant claims recite each mold cavity having a single opening. Clearly, each mold cavity in Rochlis(-583) is defined by a single opening. If the mold cavity had multiple openings, then multiple products produced by the multiple openings would be shown in the product. As clearly shown in Rochlis(-583) a single product is produced from each cavity. Therefore, applicant is arguing that the instant claims preclude other openings made by the laminate construction, but the instant claims do not require such limitations.

Applicant argues that Rochlis(-583) does not contain an enabling disclosure of how to make a mold or production tool

Art Unit: 1722

with only a single opening and actually teaches away from the claimed invention. Again, a mold having a single opening is NOT claimed. The instant claims recite each mold cavity having a single opening, as mentioned above.

Applicant argues that Rochlis(-583) emphasizes the importance of the openings between the mating surfaces of the laminations to allow for air or gas to be evolved in the molding or hardening procedure (col. 13, lines 70-73). However, Rochlis(-583) does not disclose that such openings between the mating surfaces to allow for air or gas to be evolved are CRITICAL for the operation of the apparatus.

2. The amendment filed on 23 September 2002 only cancels claims, and therefore the rejection of the remaining pending claims has NOT changed.

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph Leyson whose telephone number is (703) 308-2647. The examiner can normally be reached on M-F(8:30-6:00) First Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jan Silbaugh can be reached on (703) 308-3829. The fax phone numbers for the organization where this application or proceeding is assigned

Application/Control Number: 09/955,604

Page 4

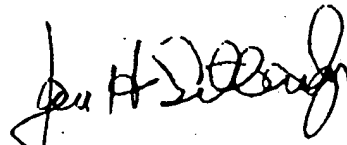
Art Unit: 1722

are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

j1

October 2, 2002


JAN H. SULLIVAN
SUPERVISORY SENIOR ENGINEER
ART UNIT 1722

10/03/02

APPENDIX VIII

Serial No.: 09/955,604

Docket No.: 49933US032

1. Rochlis et al. (U.S. Patent No. 3,312,583).

April 4, 1967

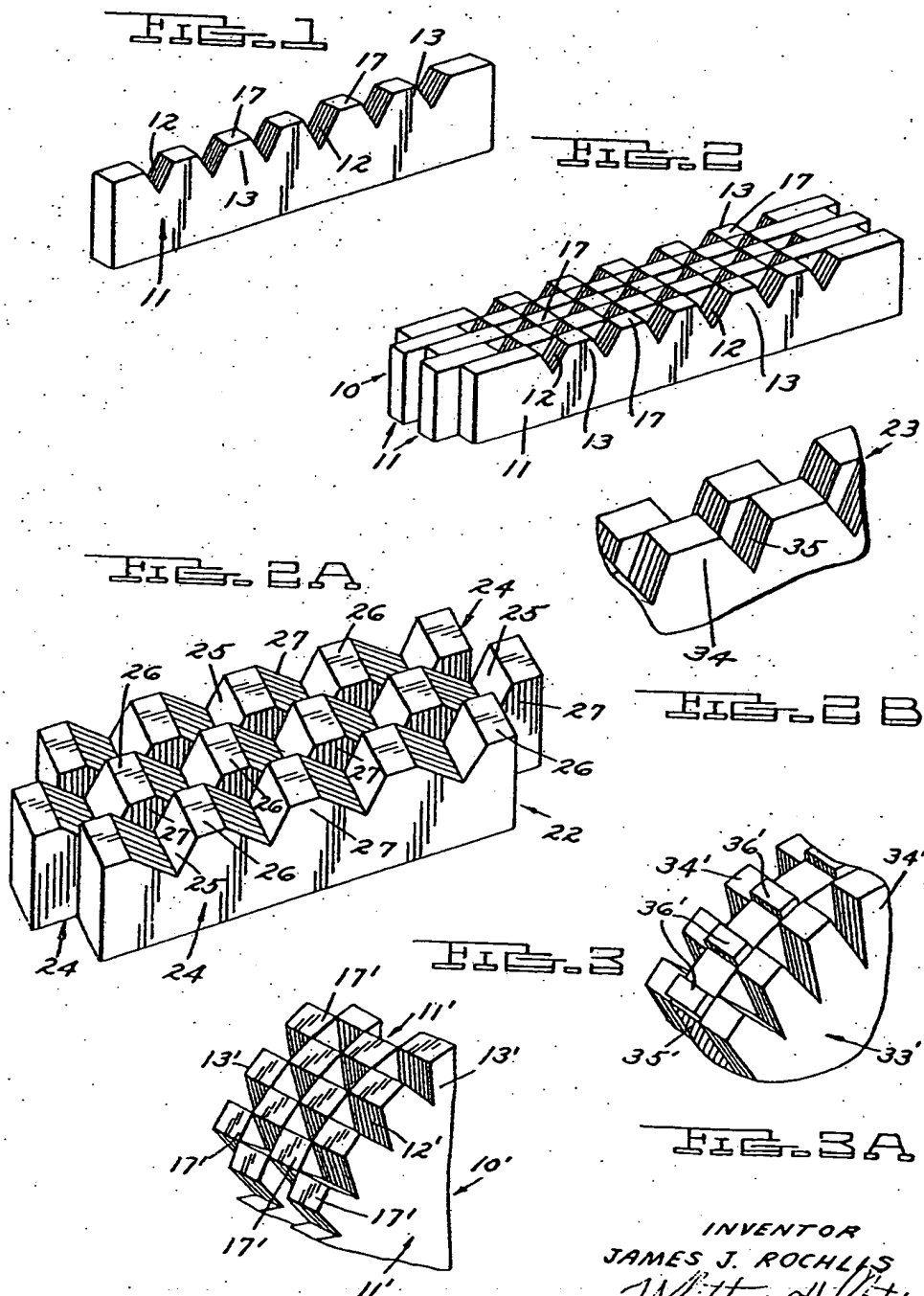
J. J. ROCHLIS

3,312,583

APERTURED AND STAGGERED MOLDED PILE PRODUCT

Filed Oct. 2, 1963

5 Sheets-Sheet 1



INVENTOR
JAMES J. ROCHLIS
BY *Wittman, Hottel & DeLoach*
ATTORNEYS

April 4, 1967

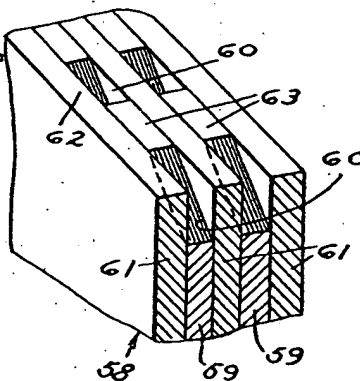
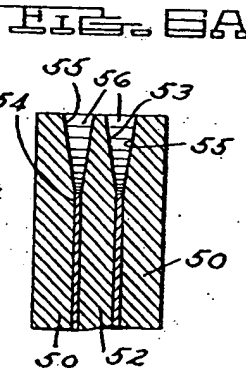
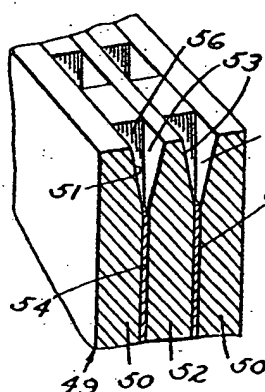
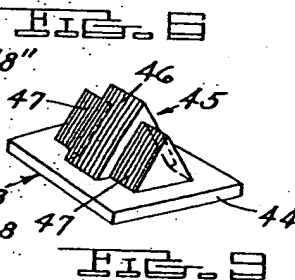
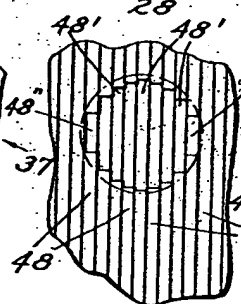
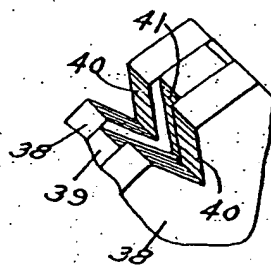
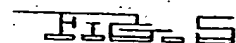
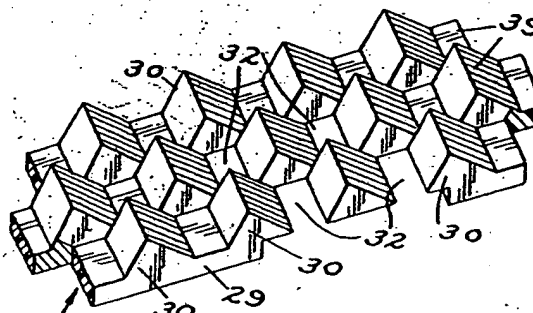
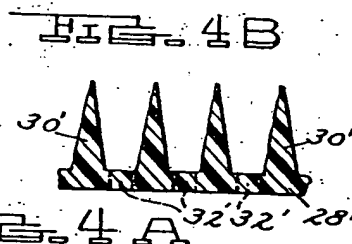
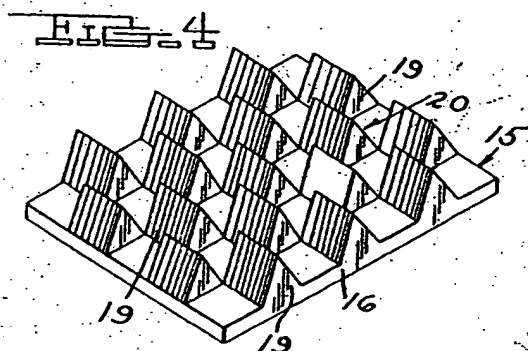
J. J. ROCHLIS :

3,312,583

APERTURED AND STAGGERED MOLDED PILE PRODUCT

Filed Oct. 2, 1963

5 Sheets-Sheet 2



INVENTOR
JAMES J. ROCHLIS
BY *William H. Gifford*
F. B. Gifford
ATTORNEYS

April 4, 1967

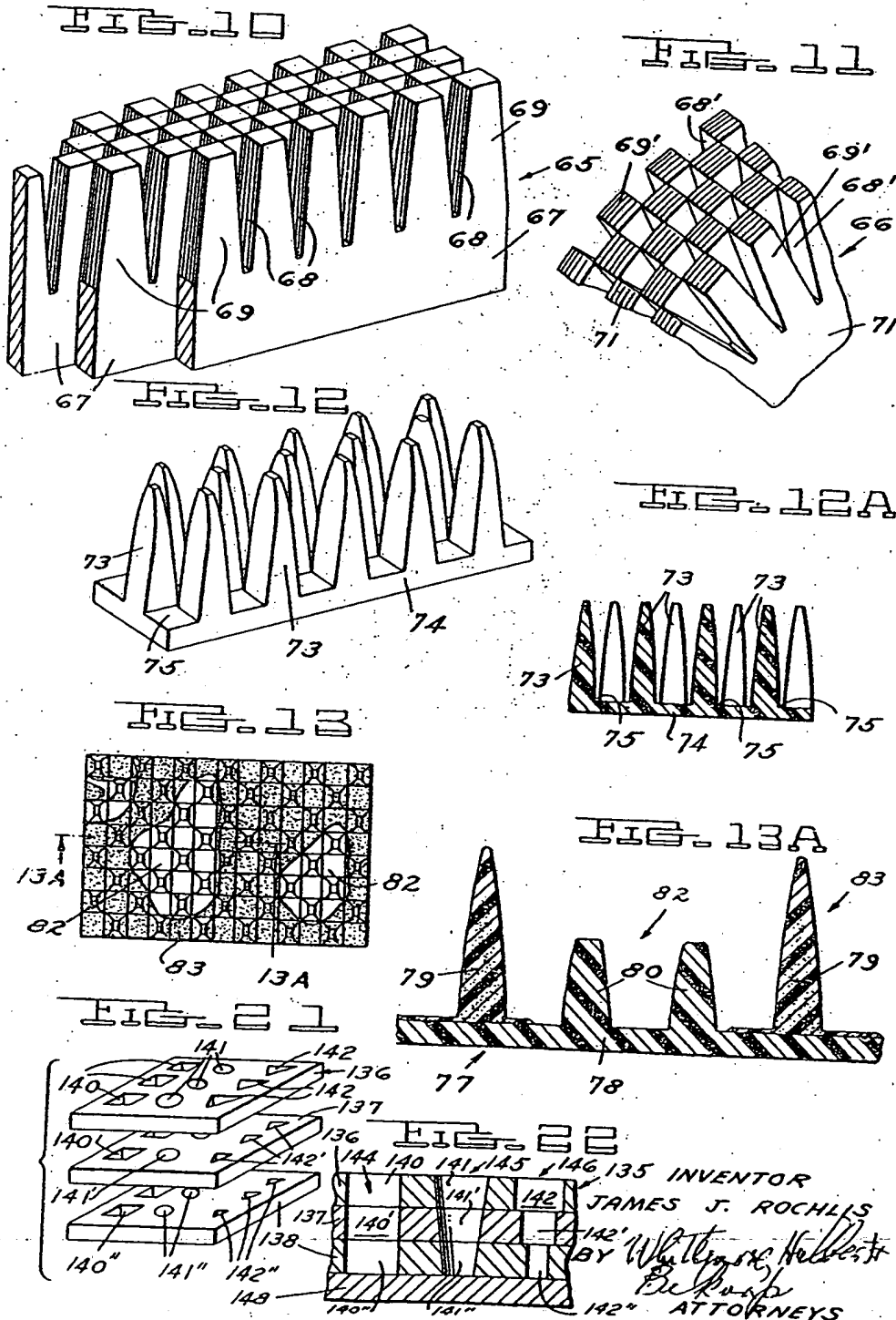
J. J. ROCHLIS

3,312,583

APERTURED AND STAGGERED MOLDED PILE PRODUCT

Filed Oct. 2, 1963

5 Sheets-Sheet 3



April 4, 1967

J. J. ROCHLIS

3,312,583

APERTURED AND STAGGERED MOLDED PILE PRODUCT

Filed Oct. 2, 1963

5 Sheets-Sheet 4

FIG. 14A

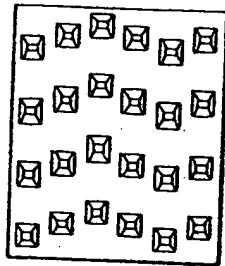


FIG. 14

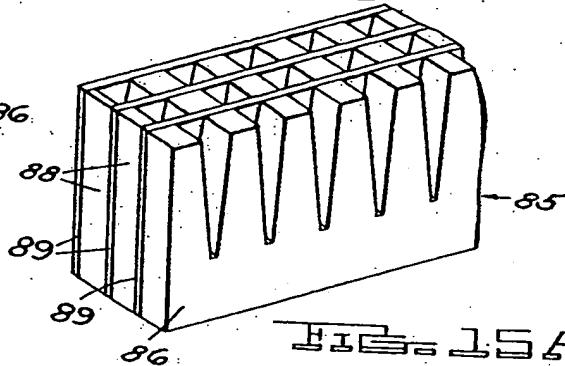


FIG. 15C

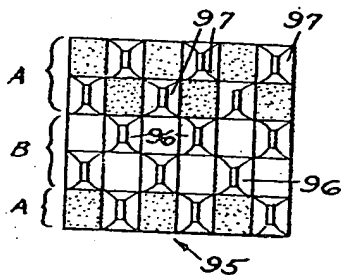


FIG. 15B

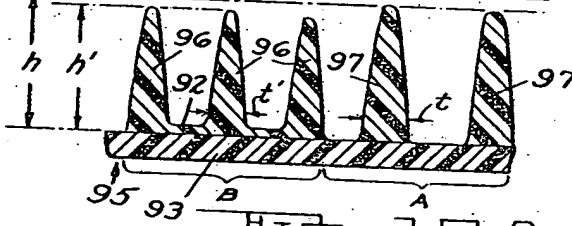


FIG. 16A

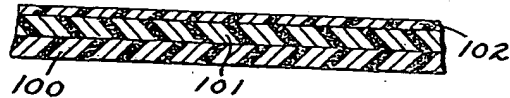


FIG. 16B

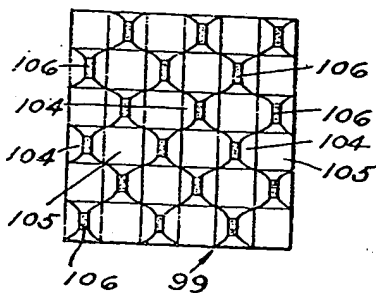
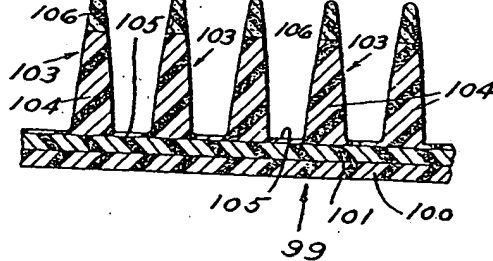


FIG. 16C



INVENTOR

JAMES J. ROCHLIS
BY *Whitcomb, McLaughlin & DeLoach*
ATTORNEYS

April 4, 1967

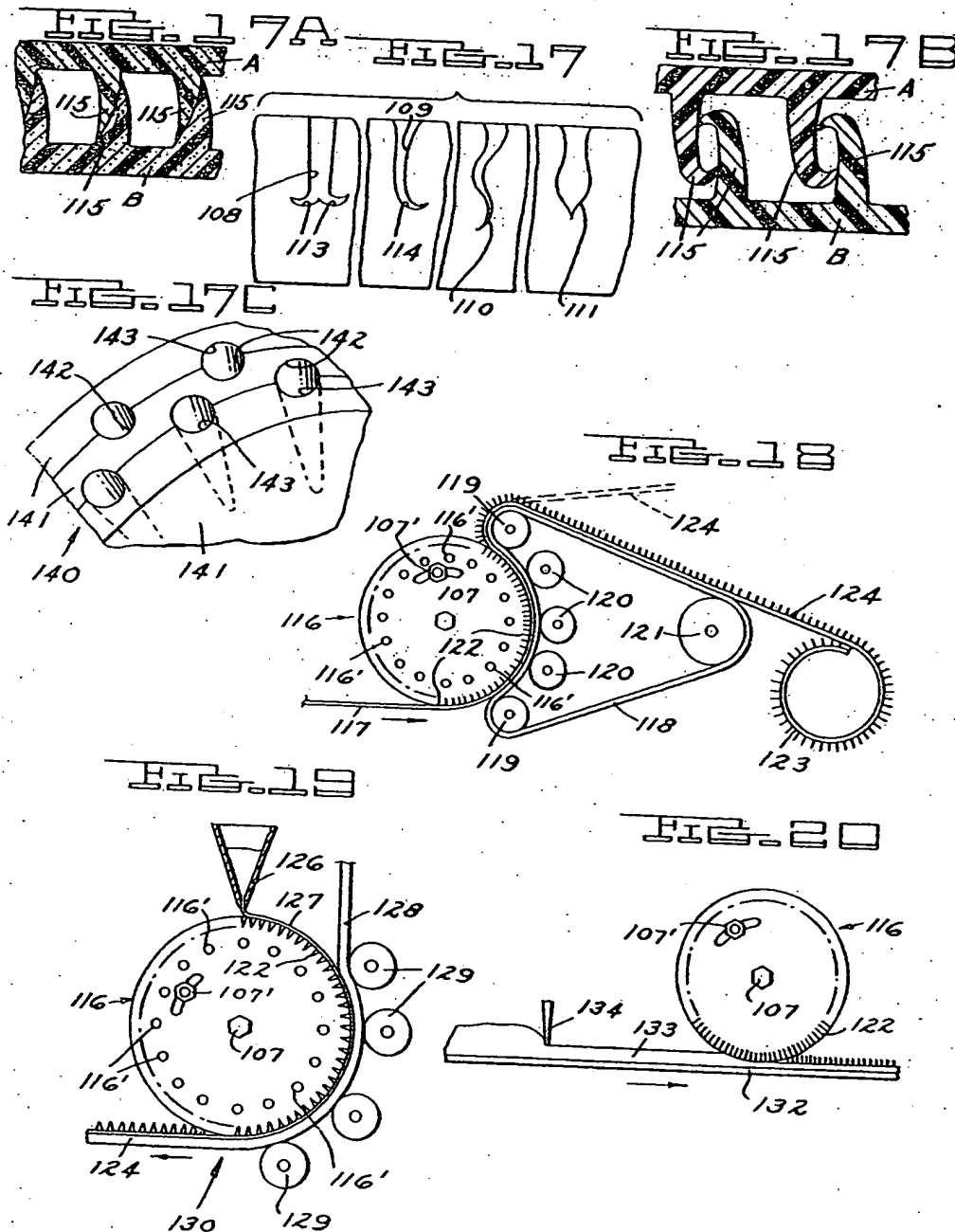
J. J. ROCHLIS

3,312,583

APERTURED AND STAGGERED MOLDED PILE PRODUCT

Filed Oct. 2, 1963

5 Sheets-Sheet 5



INVENTOR
JAMES J. ROCHLIS
BY *Whitney & Hulse*
Perkins
ATTORNEYS

APERTURED AND STAGGERED MOLDED PILE PRODUCT

James J. Rochlis, 1862 Old Orchard Road, Abington, Pa. 19001

Filed Oct. 2, 1963, Ser. No. 313,356

1 Claim. (Cl. 161-62)

The present invention relates to improvements in pile-like material and a process and apparatus for making the same in a wide variety of specific physical embodiments for many different uses.

It is an object of the invention to provide an improved type of molded material or product of sheet-like or other contour in cross section, fabricated of a thermally or otherwise softenable and moldable substance having physical characteristics suitable for the intended use, such as a thermoplastic or thermosetting resinous compound, natural or synthetic rubber, a compound softenable by a special fugitive or other agent, and the like. All such products are characterized by an improved pile-like surface of one sort or another appropriate to the intended use. With this in mind, the expression "pile" as used herein is to be considered to apply to a group of projections protruding from a surface of the product, while "pile element" is used in referring to the individual projecting formations or members making up the pile.

The invention contemplates a great many different possible sizes, shapes and spacings of such elements relative to one another, making it possible to mold pile-like products having an almost infinite number of specifically different physical characteristics, and presenting many different visual, textural and other effects; yet they are produced in common by variants of the same basic method, employing the same basic forming equipment or apparatus.

For example, one general classification of molded pile article may exhibit relatively large and thick projecting components in one or another outline (for example, generally pyramidal) and spacing relative to one another. A sheet-like product of this character is suitable for use as an anti-slip matting, which may be provided with apertures therethrough in a predetermined relationship to the pile formations as a flexible, ground gripping shoe sole, as a shock absorbing layer, as a decorative wall surfacing sheet, as an upholstering material, etc.

In another specifically different but basically similar broad classification, the piling may be of a finer nap-like or filamentary character, such filaments or strands being integrally formed on a backing sheet or surface. Such material is well suited for many diverse uses. It may be employed as a brush bristle structure of a tooth brush or other massaging, coating, scraping or squeegee-like implement. It may possibly have an abrasive substance incorporated in the molded material to improve its quality for any of these purposes.

Pile-like sheets of this sort having relatively closely spaced, filament-like pile elements may have their like pile-like surfaces pressed together to cause a mechanical frictional interfit or intergrip of their respective pilings to hold the sheets together. Similarly, if the material of the piling be composed to include permanent magnetic particles as molded, its suitability for use in a magnetic "zipper" joint is apparent.

The finely pile-like material may be utilized as a heat insulation layer of an outer garment. A quite different application of the same type of pile-like material is in a mat or carpet which may have various visual and/or textural effects, varying cushion action, etc., as the result of different physical characteristics of the component pile elements. These may be, for example, in point of their length or height, their thickness, their spacing relative to

one another or pile "population," their color, their hardness, and the like. The product may be employed as a sheet material for the making of gloves or in the molding of a complete glove, in which desired gripping and wear attributes may be had by a selective location of pile-like areas on the glove surface, by selectively treating the piles to improve wear-resistance, and the like.

Other more or less related industrial and construction adaptations of the principle of the invention are many and diversified, for example, as a sound and heat insulating structural sheeting, as a wound-up roll filter component, and so forth.

In any adaptation or embodiment of the pile-like product, particularly as a sheet, the invention contemplates the lamination of a layer, pile-like as above described, with an underlying or base layer of a porous or expanded foamy nature, the lamination being effected by heat and/or pressure in piling, thus to provide a sheet or like product having improved quality in respect to non-slippage friction, thermal or sound insulation, cushioning ability, and the like.

While it will be appreciated that only a relatively few examples typically suited for the above mentioned utilities are herein illustrated and described, they are nevertheless sufficient to indicate the wide versatility of the invention in its product aspect.

Another general object of the invention is to provide an improved method for the making of such pile-like products. This comprises the application of the material to provide the piling, for example a thermosoftenable, thermosettable or vulcanizable molding composition, preferably in a partially set but still flowable or moldable condition of a surface thereof (and, if desired, with softenable chips or crystals applied thereto) against a mold composed of a novel assembly of side-by-side arranged, marginally configured plates or laminae. The thus constituted mold may be a flat one or it may be of cylindrical or drum-like character, comprised of peripherally notched or shaped circular discs for continuous production. In either case, the plates or laminae are successively arranged in a selective manner with the notchings of one thereof in a desired relation to an adjacent lamina, or the notchings of the latter. Such selection is of course dictated by the nature of the desired molded pile effect.

In accordance with most of the embodiments herein shown, the notches in question are of a depth, regardless of the shape thereof, to extend only partially through the height or radius of the laminae plate or disc; and the notches extend wholly through the width of the relatively thin lamina. Thus, successive laminae may have their notched outer surfaces partially or wholly stepped or shifted relative to one another. The relationship in this respect determines the nature of the piling in regard to the design and population of the pile-like; in regard to a possible connection of pile elements to one another at the base thereof, or a distinct separation in this zone; in regard to a possible provision of apertures through the pile-like sheet product, etc. The shape of the notches determines the contour, height and width of the individual pile components. However, other types of assembled-laminae type mold than the through-notched type are contemplated for the production of pile formations of any desired configuration. Likewise, materials which are flowable and settable by means other than heat are contemplated.

In still further accordance with the invention, the pile formations may be of the same height throughout a given area of the product, or of different heights in that area, again as determined by the manner in which the lamina notching or other formation is selected or positioned. These and other characteristics of the product may also be determined in accordance with the relative color or hard-

ness of component layers of the molded material, as such characteristics are reflected in the physical response of the material in becoming soft and/or setting. Thus, attractive visual, patterned, carved or half-tone effects may be had.

As in the case of the pile-like product, the basic method is capable of wide variation in detail, and only a few representative embodiments are illustrated herein.

Yet another object is to provide a piling method by which a pile-like layer or stratum may be laminated or built onto an underlying or base layer which is of relatively dense, homogeneous nature, or onto a relatively porous, expanded or foamed stratum or layer for the advantages mentioned above in regard to the product.

In any event the method contemplates the initial softening of a layer surface, thermally or otherwise, sufficiently to render the material readily flowable under mild pressure into the pile forming cavities of the mold, whereupon the material is caused to set up in the cavities to provide the pile elements of desired shape and character, then stripped from the mold. In these respects the present method differs markedly from present day high pressure extrusion and press practices requiring expensive and complicated equipment for commercial production.

While the cavities of the mold laminae will ordinarily be of simple V-shape or other symmetrical contour, the invention also contemplates variations in which the mold laminae formations for the cavities may be of special design or non-symmetrical outline. This enables the production of pile-like, filament-like napped surfaces having desired special characteristics of appearance, textural feel, cushioning quality, thermal or sound insulating quality, etc. It is also within the contemplation of the invention that a layer or lamination of layers may be pile-like on only one surface or on both opposite surfaces.

Another object of the invention is to provide improved equipment or apparatus for the high production and high efficiency practice of the method to produce the pile-like articles mentioned above.

A further object is to provide an improved method, and laminated disc equipment for practicing the same, in which the molding notches or cavities of most embodiments, extending as they do from side to side of the mold laminae (and in some cases through the thickness of the molded sheet), permit air or other evolved gas to escape during the molding or forming phase. It is therefore not trapped in the mold cavity in a manner to possibly alter the shape or size of the pile elements, which are therefore uniformly perfect throughout the pile area.

Moreover, the mold laminae may be produced very rapidly and inexpensively by a simple stamping operation.

Reference has been made both to the formation of molding cavities by notching a lamination of side-by-side mold plates in a direction inwardly of the edges of the laminae, i.e., in a direction paralleling the planes of their engaging surfaces. However, similar effects may be had by aperturing the plates within their edges and in a direction transverse of their meeting planes; and varying pile effects are possible by varying the character of the apertures. These may be formed by punching, drilling or other type of machining of the plates, by etching or by some other appropriate type of perforating of the stacked metal mold laminae, as will be described.

It is seen, however, that the method and apparatus differ more broadly in principle than in these respects from standard molding procedures and structures of known types, in that a relatively soft-surface material to be molded is forced, under relatively mild pressure, into molding cavities constituted by the laminae notches or other formations, the flowable material fully entering the mold cavities and being shaped thereby. This is usually attended by a heating or cooling of the mold to at least partially set the molded piles; whereupon the product is stripped from the mold. If desired, the pile-like product may also be simultaneously bonded to a backing mem-

ber, or, as indicated above, it may be pile-like simultaneously on both of its sides.

The foregoing as well as other objects will become more apparent as this description proceeds, especially when considered in connection with the accompanying drawings illustrating preferred embodiments of the invention, wherein:

FIG. 1 is a perspective view of a single component mold lamina of a flat, plate-like notched character, which is adapted to be assembled with others of a similar type in the making of a mold for the purpose of the invention, in an embodiment of the latter;

FIG. 2 is a fragmentary perspective view showing such similar laminae assembled in one suggested side-by-side relation to form a flat mold having alternate, fully staggered pile forming notches;

FIG. 2A is a similar view illustrating another possible arrangement, by using which it is possible to make a pile-like product generally similar to that formed on the mold of FIG. 2, but further featuring a zig-zag base grid network, enabling the piles to hold together without further base structure, even though holes are formed through the grid network, if desired;

FIG. 2B is a fragmentary perspective view of still another alternative arrangement in modification of what is shown in FIG. 2;

FIG. 3 is a fragmentary perspective view of the basic invention depicted in FIG. 2, but as embodied in a cylindrical or drum-like mold for continuous production, and it is to be understood that flat mold arrangements such as those of FIGS. 2A and 2B are also contemplated to be of cylindrical mold outline;

FIG. 3A is a view similar to FIG. 3 of a portion of a mold which may be employed in making a pile-like sheet which is perforated or porous through an otherwise continuous base member;

FIG. 4 is a perspective view showing a portion of a molded pile product formed to a mold of the character of either FIG. 2 or 3;

FIG. 4A is a fragmentary perspective view of a pile-like product formed on a mold using the idea of FIG. 2A, FIG. 4A also showing how the base of the product may be made apertured if desired, with a grid-like arrangement integrally merging its pile elements with one another;

FIG. 4B is a fragmentary section through an apertured or porous sheet produced from the mold of FIG. 3A, the pile elements of which exhibit a separated, discrete character;

FIG. 5 is a fragmentary perspective view illustrating a further slight modification in the mold, which is in this case constructed of side-by-side mold laminae or discs having different outlines at the forming notches;

FIG. 6 is a fragmentary perspective view of a pyramidal-shaped pile element of a product formed on the mold structure of FIG. 5;

FIG. 6A is a plan or radial view in exaggerated scale of a portion of a mold following the general principle of that of FIG. 5, but enabling the production of pile elements which are of curved or circular cross-section, and either conical or cylindrical shape in elevation;

FIG. 7 is a fragmentary perspective view of a further alternative type of mold, featuring two-way tapered molding notch formations produced by assembled mold plates or discs of different character;

FIG. 8 is a view in vertical or radial cross section through the mold laminae of FIG. 7;

FIG. 9 is a fragmentary perspective view similar to FIG. 7, but showing a still further modified arrangement of mold-forming plates, alternate ones of which have plain outer peripheral edges;

FIG. 10 is a perspective view of a portion of a flat type of mold, generally similar in underlying principle to that of FIG. 2, but employed for the production of a pile-like product having a multiplicity of quite clon-

gated and relatively closely spaced, pile-like pile elements or filaments;

FIG. 11 is a fragmentary perspective view showing a drum-type mold having molding formations like those of the flat mold of FIG. 10;

FIGS. 12 and 12A are, respectively, fragmentary views in perspective and in vertical section showing a portion of a product of the mold of either FIG. 10 or 11, featuring pile elements of relatively uniform height and uniform and longitudinal transverse spacings, respectively;

FIGS. 13 and 13A are, respectively, fragmentary top plan and vertical sectional views, the latter in greater scale, of a pile-like sheet produced by the use of a moldable base and moldable piling chips or materials which are of different color and/or hardness characteristics, with a resultant patterned and/or carved effect in the product;

FIG. 14 is a perspective view of a portion of a multiple laminated mold employing plain laminae alternating with notched laminae, being somewhat similar to the mold of FIG. 9;

FIG. 14A is a plan view of a portion of a sheet molded to a mold generally similar to that of FIG. 14, but with the forming laminae of the latter shifted relative to one another to produce staggered and more widely spaced pile elements on the product;

FIG. 15A is a fragmentary section through a pair of superposed plastic sheets used in producing a product with a distinctive half-tone-like appearance;

FIGS. 15B and 15C are, respectively, top plan and vertical sectional views, the latter in enlarged scale, of a pile-like sheet produced from the laminated sheet of FIG. 15A by an alternative method, i.e., using a mold in which various sections of the pile forming notches of the mold have different heights and/or spacings relative to one another, thus resulting in varying visual tones in the product;

FIG. 16A is a vertical section through a multiple laminated plastic sheet assembly used in the production of a still further visual effect;

FIGS. 16B and 16C are, respectively, top plan and vertical sectional views of a pile like article made from the laminated sheet of FIG. 16A, in which different shade or color effects are produced by pile elements of approximately equal length;

FIG. 17 is a fragmentary side elevational view of a mold lamina in which mold notches or formations of different contour may be selectively employed in the production of pile elements having molded outlines in a variety of shapes;

FIGS. 17A and 17B are fragmentary sectional views showing how pile outlines such as those of FIG. 17 may be employed for producing a mechanical pile interlock of sheets;

FIG. 17C is a fragmentary perspective view of a mold for the production of sheets or other articles having pile elements of various different section other than generally rectangular, such as circular, oval, and the like;

FIGS. 18, 19 and 20 are schematic side elevational views of alternative embodiments of molding apparatus which may be employed in forming pile-like products of the above described types, pursuant to the invention; and

FIGS. 21 and 22 are, respectively, exploded perspective and sectional views showing a basic optional procedure in assembling mold lamina plates which are apertured otherwise than from edges thereof to provide mold cavities, FIG. 22 showing the apertured laminae arrangement in association with a cavity-closing base plate.

Referring to the drawings, FIGS. 1 and 2 illustrate the construction of a flat or planar type mold which may be used in the production of a sheet or like pile-like product such as is shown in FIG. 4. As in the case of all embodiments of the invention, this mold, generally designated 10, will be applied to and operated by molding

equipment of the general sort illustrated in FIGS. 18, 19 and 20 of the drawings, to be hereinafter referred to.

The mold 10, of which a portion is shown in FIG. 2, is shown as being comprised of a plurality of like, side-by-side assembled plates or laminae 11, each of predetermined top-to-bottom height and formed to provide a plurality of molding notches 12 in equal longitudinally spaced relation to one another along the top edge thereof. These notches are separated from one another by upwardly truncated portions 13 of the respective laminae. The notches 12 are, in the illustrated forms appearing in the drawings, of like V-shaped contour, extending well into the body of the lamina a distance determined by the desired thickness and height of the pile elements, just as the width of such elements is determined by the thickness of the lamina across its upright sides.

Rather than being uniform in shape and spacing, the mold notches or recesses 12 may differ in these dimensional respects; and this holds true in regard to other illustrated embodiments of the mold lamina, except, of course, when the physical nature of the intended product forbids. Examples of such variants will be described.

Likewise, in any of the forms of the mold illustrated and described herein, the mold laminae may be fabricated of a suitably heat conductive metal, or of a non-metallic material capable of being formed in notched laminae, and to withstand thermal conditions arising in the molding procedure. Thus, in a thermo-softening, thermo-setting or vulcanizing operation, the mold may be called upon to withstand temperatures ranging from 190° F.-380° F., in which the moldable material, such as a known vinyl compound, may be in a flowable, semi-molten condition.

Referring to FIG. 4, the product of the mold construction of FIG. 2 (and also of the mold of FIG. 3) is seen to be a flat sheet, generally designated 15, characterized by a base layer 16 of a thickness determined by the thickness of the molded material left to overlie the flat top or crest areas 17 (FIGS. 1 and 2) of the laminae 11 intervening between their V-notches 12. From this layer 16 extend pile elements 19 (FIG. 4) which are of triangular or pyramidal cross sectional outline. In the embodiment under consideration, the pile elements or components 19 are of relatively thick nature, as distinguished from the more filamentary pile shapes hereinafter described. As thus composed, the pile or piling of the product, generally designated 20 in FIG. 4, is well suited for use as floor carpeting or anti-slip matting, as an improved, modified type of "ripple" shoe sole having the advantageous ability of flexing both transversely and longitudinally as well as obliquely in reference to these directions; or as a decorative, construction or industrial layer of any of the sorts mentioned above. In a suggested shoe sole or matting application it is to be noted that the total frictional or wear area presented by the piling is no less than that of known products having continuous, rather than staggered formations. Particularly in regard to a shoe sole use, the weight of the wearer is distributed in a very regular and uniform manner, with increased comfort to the wearer.

FIGS. 2A and 2B show portions of the mold structure, that of FIG. 2A being generally designated 22 and that of FIG. 2B being designated 23, which comprises an assembly of mold laminae 24, in structure only slightly different from the laminae of FIG. 2, but with the laminae shifted relatively in the direction of their length to cause a different staggered effect than that of the mold 10 of FIG. 2.

Thus, in FIG. 2A, the width of the notches 25, in the longitudinal direction of the lamina 24, is somewhat greater than that of the notches 12, with the result that the truncated crests or tops 26 of the pile formations 27 of one lamina 24 may be overlapped, at both sides, by the notches 25 of the succeeding lamina.

This enables the production of a sheet such as shown in part in FIG. 4A. If it be desired that this sheet, gen-

erally designated 28, be of an imperforate nature, the moldable material will be deposited upon the mold 22 in a thickness to substantially overlie the flat crests 26 of the pile elements 27. There thus results a sheet having a base 29 from which triangular or pyramidal pile formations 30 protrude; and these pile formations integrally join one another at their longitudinal overlaps to produce piling having a grid-like base characteristic at the thus-merged pile elements 30, i.e., a zig-zag outline.

On the other hand, if the molded material be forced, scraped or doctored off flush with the flat crests 26 of the mold 22, the product (as shown in FIG. 4A) will exhibit apertures or holes 32 through its base 29, the remainder of the sheet being connected at the piles. That is, the longitudinal dimension of the pile formations 30, in the direction of a given row, exceeds that of the apertures 32 of the next adjacent row, which apertures are overlapped at each end by the transversely aligned formations of the given row. Such a product may be advantageously used as a floor or bath mat having increased flexibility, as well as an ability to drain liquid, by reason of the apertures.

In FIG. 2B, the mold laminae may be similar to the laminae 24 of FIG. 2A, but with only a partial overlap of the portions 34 between notches 35. Here again, a connected grid-type base conformation is the result, but with the pattern of the pile elements somewhat different from what is depicted in FIG. 4A, in regard to the longitudinal and transverse staggering of the piles.

FIG. 3 of the drawings represents a mold constituted by circular, peripherally notched discs in a relative arrangement similar to that of the flat mold construction 10 of FIG. 2. Accordingly, because of this simple basic difference, the mold fragmentarily shown in FIG. 3 is designated 10' and all of its structural features, and relationships corresponding to those of FIG. 2 are designated by corresponding reference numerals, primed. Further description may thus be dispensed with, with the observation that the mold of FIG. 3 will produce a product like that of the article 15 of FIG. 4.

It is to be understood that alternative arrangements of the disc laminae 11' of FIG. 3, corresponding to those of FIGS. 2A and 2B may be adopted, for the production of articles similar to the sheet article 28 of FIG. 4A.

Should it be desired to produce an apertured or porous pile-like sheet, such as is shown in FIG. 4B, but characterized by a base 28' having perforations 32' therethrough alternating laterally and longitudinally with piles 30' which preserve their individual, discrete character (rather than being integrally merged at their bases as in FIG. 4A), a mold 33' like that of FIG. 3A will be employed. It has the usual sort of notched laminae 34' spaced from one another by discs or laminae 35' which have radial or outward projections 36' alternating with the notches of forming laminae 34'. These projections will penetrate the material of the base layer 28', as shown in FIG. 4B, leaving the perforations 32' in the latter, yet with the piles 30' wholly discrete and separate from one another, as in the product of FIG. 4.

FIG. 5 shows a portion of another mold element, generally designated 37, constituted by alternating disc laminae 38, 39 of different peripheral notching patterns. Thus, the discs 38 may be provided with V-notches 40 of a like given width and radial depth; while an intervening disc 39 features V-notches 41 of different (shown as greater) width and depth.

This mold will produce a pile-like product of which a portion, designated 43, is illustrated in FIG. 6. It has a base layer 44 of substantial thickness from which there integrally projects a composite triangular or pyramidal pile formation 45 having a central large component 46, integrally faced on either side by smaller formations 47 of stepped shape. It will be appreciated that the mold 37 of FIG. 5 may have its discs 38, 39 notched about the periphery thereof, so as to produce parallel rows of

the pile formations 45, and that the sets of notches may be staggered relative to one another, as per FIGS. 2, 2A, 2B and 3, in accordance with the wish of the maker. In substantially all cases, the pile elements or formations 20, 30 or 45 will have linear alignment in the direction of the respective rows, and approximate transverse alignment in the general direction transverse of said rows, as determined by the scheme of staggering the respective molding formations of the mold laminae, whether they be flat or circular. However, the piles may also be at random.

FIG. 6A shows a variant of the type of mold of FIG. 5 for the production of pile elements which, rather than being of the stepped pyramidal shape, may be generally circular in cross section, and of a tapered conical or cylindrical contour in elevation. As before, such mold, whether flat or roll-like in character, is constituted by laminae 48 which are provided with edge notches 48' across the individual lamina thicknesses, the notches being of different widths in the direction in which the respective laminae extend. Thus the central notch 48' is of greatest width, and the notches of laminae progressing from opposite sides thereof are of progressively diminishing width. The series ends with notches 48'' of minimum width which are spanned externally by unnotched laminae.

The result is to reduce a molding cavity which, though stepped in increments about its perimeter, approximates a true circle (such as is shown in dot-dash line in FIG. 6A); and it will be appreciated that other variations in the width of the notches relative to one another will result in mold cavities which, while they perhaps approach a bit less a perfect circle in cross section (for example, elliptical), are nevertheless substantially curved in perimetral outline.

By stamping plate or lamina edge notches 48' in a rectangular outline in the plane of the lamina there will result a molding cavity of substantially cylindrical or parallel-sided shape; while if the notches are, as in other embodiments, V-shaped, the resultant mold cavity will be substantially conical or tapering-sided. In any instance, the molded material tends to form in a rounded external outline, rather than in sharply defined increments of perimeter, so that the resulting molded pile elements may be considered as being truly curved surfaced in cross section.

FIGS. 7 and 8 illustrate alternative arrangements of mold or mold-constituting laminae of differing character, the mold being either a flat one, per FIG. 7, or cylindrical. Here, a section 49 of the mold is composed of a pair of like lamina plates or discs 50 which are radially inwardly beveled or tapered at a land 51 adjoining the outer edge or periphery thereof, and an intermediate plate or disc lamina 52 which is similarly tapered at 53 along both of its outer side surfaces.

Between the lamina 52 and the respective laminae 50 on either side thereof there are interposed a pair of like, relatively thin plates or discs 54, which are similarly tapered outwardly divergent at sides 55 adjacent the outer edge thereof; and the laminae or discs 54 are provided with inwardly convergent V-notches 56 at spaced intervals along or about the length thereof. As thus constituted, the mold segment 49 will produce linear rows or series of piles having a pronounced two-way outward taper from the base of a sheet otherwise similar to those appearing in FIGS. 4, 4A and 6.

FIG. 9 shows a fragment of a further, alternative type of mold segment 58 composed of a plurality of lamina plates 59 having V-notches 60 along or about the edges thereof, which laminae are alternately spaced by plain, unnotched plate laminae or discs 61, the outer edges 62 of the latter coming flush with the flat top lands or crests 63 of the notched plates. In the embodiments of FIGS. 7 and 8 and FIG. 9, the respective segments 49 may be arranged to alternately stagger notches as desired, and

thus produce varying appearing and textured pile-like products.

FIGS. 10 and 11 of the drawings respectively illustrate alternative forms of laminated mold, respectively designated 65 and 66, in flat and cylindrical shapes; while FIGS. 12 and 12A show pile-like products molded to such mold structures.

In the embodiment of FIG. 10, the mold 65 is comprised of successively side-by-side plates 67 whose V-notches 68 are seen to be very deep as compared with the transverse and longitudinal widths of the notches. Such notches are spaced by upwardly truncated molding formations 69, likewise of relatively great height as compared with the rectangular cross sectional dimensions thereof. The staggered arrangement of the laminae 67 is seen to be the same as that of FIG. 2.

FIG. 11 simply shows a similar assembly 66 of laminae 71 which are of circular outline to constitute a cylindrical or drum-like mold. In other respects, the laminae 71 of FIG. 11 are like the laminae 67 of FIG. 10, so that corresponding structural features and relationships are designated by corresponding reference numerals, primed, and further description is dispensed with.

The product molded to either of the molds 65, 66 is, as shown in FIGS. 12 and 12A, characterized by pile formations 73 integrally extending from a sheet-like base 74, but of a relatively elongated, filamentary or bristle-like nature, as compared with those of the preceding embodiments. As in the case of the latter, the pile elements or formations 73 may be produced in a wide variety of staggered relationships to one another, at the choice of the user in his selection and relative disposition of the mold laminae 67, or 71.

Characteristically, and this applies also to the products of FIGS. 4, 4A, 6 and others similarly produced, a molded material, such as a vinyl plastic, tends to form in setting to a cross sectional outline other than precisely rectangular, or in a somewhat shrunken, rounded-corner cross sectional outline such as it is intended to depict in FIGS. 12 and 12A. Such natural shrinkage in setting will bring about the presence of longitudinal spaces at 75 (FIG. 12A) at the integral juncture of the pile elements 73 with the base 74, thereby having the effect of creating rows of longitudinally aligned pile elements, which rows are transversely spaced slightly from one another to afford distinct filamentary, bristle-like pile formations. As in all of the above product embodiments, the pile elements or formations converge outwardly from an integral joint with a base surface or member of substantial thickness. The formations of the parallel rows are at least partially staggered relative to one another in the longitudinal direction of those rows, with the result of producing approximate transverse alignments of pile elements of transversely non-successive rows. The horizontal cross section of each pile formation adjacent the base surface is approximately, though not exactly, rectangular; and in the illustrated embodiments the opposed parallel side elements of each section are disposed normal to the direction of the rows, the remaining opposed sides paralleling that direction.

The invention also contemplates various modifications in the pile-like product which are produced by varying the heights of the pile formations or elements, or their relative spacings from one another in the transverse or longitudinal senses; or by controlling the hardness or color of ingredients of the molded composition; and thereby varying the rate of heat absorption of the material and thus vary the height of the pile elements of the product as a whole in different areas thereof. In this manner, various eye-catching visual pattern effects, various textural and visual contrast effects, etc. may be produced. Thus, FIGS. 13 and 13A disclose a part of a sheet product 77 having a base 78 from which integrally extend pile formations 79, 80 of respectively different heights (see FIG. 13A), the effects being exaggerated somewhat for

clarity. Such product is molded to a mold of the general type of FIG. 10 or 11, i.e., one in which the respective mold formations 69 or 69' are uniformly shaped and dimensioned. It is possible to attain this differential height characteristic of the pile components 79, 80, hence the locally patterned or carved visual effect of FIG. 13 by using softenable and moldable chips of different hardness to constitute different portions of the area of the molded layer, so that the flowable material will set permanently in the mold at different times in the respective areas represented by the pile formations 79 and 80. The same effect may be attained using at the different contrasty areas, such as are designated 82 and 83 in FIG. 13, chips or other softenable material of different colors or shades. Thus, black chips applied to and forming the darker areas 83 will soften sooner and fill the mold cavities faster than white chips at the areas 82; and the result is a pile-like product which presents not only visual color or shade contrast, but also a carved effect due to the differential height factor of the pile elements 79, 80. A highly attractive floor matting may thus be produced, or a sheeting very well adapted to other utilizations calling for a distinctive appearance effect.

FIGS. 14 and 14A represent, respectively, a section of a composite mold 85 and a product 86 molded thereto. These simply illustrate the manner in which rows of longitudinally spaced pile elements may be not only longitudinally staggered variably in the longitudinal sense, but also how the transverse spacing of the rows from one another may be controlled as desired.

Thus, the mold 85 is shown as composed of side-by-side assembled mold laminae 88 successively spaced from one another by plain edge strip laminae 89. A desired selection of the width of the spacers 89 enables the transverse spacing of pile rows to be controlled as desired. FIG. 14A is illustrative, and also shows how the mold cavities may be arranged, if desired, to form pile elements in a more or less random relation to one another, not necessarily in rows of transversely aligned formations as depicted in the mold of FIG. 14.

FIGS. 15A, 15B and 15C show a lamination of layers or plies 92, 93 for the molding of a pile-like sheet having different characteristics of shade contrast, much in the manner of the half-tone printing operation. In the production of such a contrasting tone product or sheet 95 (FIGS. 15B and 15C), an initial lamination of sheets 92, 93 is formed under pressure against a mold so constituted as to form a series of pile formations 96 of one height (h) and/or thickness (t) and a series of generally similar pile formations 97, but of a different height (h') and/or thickness (t'), as well as spacing from one another, as shown in FIG. 15B.

Thus, the product 95 will exhibit zones, such as the zones "A" of FIG. 15C, which are of one degree of darkness or shade, and other zones "B" which are of a different or lighter shade. So, if it be assumed that the layer 92 of FIG. 15A is white and the layer 93 is red, the different proportioning and spacing of the mold cavities will result in a zone "A" containing pile elements 97 which is darker in shade and/or color than zones at "B." Desired striped visual characteristics may be attained due to this attribute, akin to a half-tone reproduction, by the use of different tuft heights and/or spacings.

FIGS. 16A, 16B, and 16C represent the production of still another modified embodiment, i.e., a sheet product 99 which may be considered to have been molded from a lamination (FIG. 16A) of different softenable sheets, for example, a bottom, relatively hard base sheet 100, perhaps red in color, a softer white sheet 101 in equal thickness laminated to sheet 100, and a third upper overlay sheet 102 of substantially less thickness and, for example, black. When pile-like, the pile projections 103 exhibit body portions 104 of black, merging at their bases with black areas 105, and capped at their tops by tips 106 of white, all pile elements 103 being of equal height.

While in the above described alternatives the component mold laminae are shown as being flush across the surfaces exposing the mold cavities, it is to be understood that they may be non-flush in this respect, with resultant different product characteristics. See FIG. 3A, for example.

Any suitable means, such as the driven shaft and retainer means 107 of FIGS. 18-20, may be employed to secure the mold laminae together in an optionally adjusted relationship. Conventional arcuate slot and bolt provisions 107' may be employed for the adjustment.

In the embodiments of the invention described above, the molds have been shown as edge-notched in a manner to produce pile elements of a simple symmetric shape, as a V-notch rectangular in cross section throughout its height. However, as illustrated in FIG. 17, the invention contemplates further modifications in this regard. Appearing therein are four suggested notch outlines, as viewed in a direction from the flat upright side surface of the mold plate or lamina. These notch outlines, respectively designated 108, 109, 110 and 111 may be generally symmetric, as the notch 108, but non-rectilinear sided and inwardly terminating in laterally outwardly flared curved portions 113; or they may be hooked at 114 (notch 109); or of sinuous contour in notch 110; or they may be of symmetric-sided, curved yet downwardly convergent character, as the notch 111. Pile-like materials produced from molds constituted by laminae of these sorts will exhibit distinctive differing textural features, and many other mold designs are of course available.

Of whatever character or shape they may be, the notches through the edges of the mold laminae, extending completely from side to side of the latter as they do, may be readily and inexpensively produced, as by die stamping the respective individual laminae and then assembling them together in the desired mold notch pattern.

Since the molded material is a flexible one of amorphous internal structure, and can yield for withdrawal of the pile formations, long or relatively short, from the notched mold cavities, any desired configuration of pile elements is possible, as evidenced by the special forms of mold lamina shown in FIG. 17.

FIGS. 17A and 17B suggest how the invention may be utilized to produce pile-like sheets which will interlock at the pile elements thereof when pressed together. This could serve the function of a "zipper" type fastening.

As depicted in FIG. 17A the pile elements 115 of the respective sheets A and B are shown as molded of a material having particles of magnetic material, such as alnico, incorporated therein, as indicated by stippling in FIG. 17A. This provides a very strong magnetic intergrip of the pile elements 115 when intermeshed as shown in that figure. In FIG. 17B the elements 115 are shown as hooked in form and in an interlocked relationship to afford a similar releasable connection of the sheets A and B to one another.

In the above described embodiments the pile members have been illustrated and described as being of a regular, substantially rectangular cross-sectional outline, whatever the nature of their shape may otherwise be. In most cases the pile elements have been characterized as being generally pyramidal or triangular; though a mold for a curved section element is shown in FIG. 6A. Forms of this kind are very practical, since it is possible, as indicated above, to produce the mold laminae fast, efficiently and cheaply by a die stamping and edge notching operation.

However, FIG. 17C shows an alternative type of mold 140, constituted by a side-by-side series of laminae or discs 141 each having a longitudinal series of recesses 142 extending inwardly thereof from an outer side edge. When registered with one another these recesses of successive laminae 141 form the molding cavities 143 extending radially inwardly from a disc edge, successive cavities being separated from one another by the material of the lamina. It will be appreciated that such cavities 143 may

be of any desired shape, cylindrical, conical, of non-circular outline, rectangular outline, etc. Usually they will be of circular outline like the product of the mold of FIG. 6A.

FIGS. 18, 19 and 20 show various suggested procedures and apparatus for the forming of the moldable material against a mold constituted in accordance with the above illustrations. In each case the mold structure as a whole, generally designated 116, is a cylindrical or drum-like one for continuous quantity production, but might equally well be of a flat plate character for job production. The mold may be constituted by an assembly of edge-notched plate laminae, as described above, or by an assembly of flat or circular plates which are through-apertured from the sides thereof, as will be described.

In FIG. 18, the mold drum 116 may be constructed of appropriate metal or other material having necessary heat-resistant quality, in the event heat softening or setting is involved. A sheet or web layer 117 of the moldable material, for example, an elastomeric vinyl material or the like is trained and advanced around the cylinder or drum, as by means of an endless pressure belt 118 actuated around idler rollers 119 and pressure applying rollers 120, with belt tension maintained by an adjustable back-up roll 121. The pressure need be only sufficient, depending on the flowability of the molding material, to cause it to flow into and form in the mold cavities. The drum 116 has suitable elements or coils 116' for heating or cooling the same, if required; and the speed of rotation of the drum and travel of the material 117 is adjustable to permit at least a partial hardening of the material, as pile-like by pressing the same into the piling notches 122 of the drum, so that after leaving the latter, the pile elements will retain their molded shape. Some further curing or setting of the web or sheet may be necessary after it leaves drum 116; and it may do this in being formed into a roll at 123, or by being led off for severance into desired lengths, as indicated in dotted lines, the pile-like material being in each case designated by the reference numeral 124.

It is to be understood that in any of the embodiments of FIGS. 18, 19 and 20, the procedure contemplates the further lamination to the basic sheet or web 117 of necessary or desired backing material or sheets, per FIGS. 15A and 16A. It is also contemplated that any desired application of softenable chips may be applied to the web 117 as an incident to the piling operation.

FIG. 19 shows an arrangement in which a flowable material, as in the formation of a plastisol, is applied to the drum 116 through an elongated, hopper-like nozzle or slit 126, entering the notched mold cavities 122 of the component mold laminae and further providing material for formation of a backing sheet layer or stratum 127. The material is urged against mold drum 116 by a further web or sheet 128, which may be at the same time bonded to the layer 127. Desired pressure is applied by rollers 129, the bonded laminate issuing at 130 for further completion (if necessary) and disposal as desired. As in the embodiment of FIG. 18, pressure is applied approximately 180° about the drum 116 to insure the desired degree of setting of the piling.

FIG. 20 suggests the procedure of horizontally advancing a wholly or partially processed sheet 132 in the direction of the arrow to which a substantially thick coating or layer 133 of plastisol or like flowable and moldable material is applied, and controlled as to thickness by a doctor blade 134. This material is pile-like in the manner described above and bonded to the sheet 132 in passing the mold drum 116.

The invention further contemplates a procedure including the application of powdered crystalline or particulate material capable of being rendered flowable and moldable to the periphery of a heated mold drum 116. Such softened material is pressed into the mold notch cavities by any suitable means, such as the belt arrangement of

FIG. 18, or a separately pressed web which may bond to the resin, emerging from the mold as a laminated component of the pile-like sheet. In all cases, it is contemplated that the product may be formed of a rubber compound, being set in desired condition by a vulcanizing procedure.

FIGS. 21 and 22 of the drawings illustrate an alternative procedure for assembling the mold, generally designated 135 in FIG. 22, which differs quite substantially from the previously described embodiments, in that the molding cavities are arranged to extend in a sidewise direction of the lamination of plates, rather than from an edge thereof. However, in the broadest sense of the molding procedure, the same principle is followed as in the earlier-described forms.

Thus, successive laminae 136, 137, 138 are provided, which may be either flat, per FIGS. 21 and 22, or arcuate so as to produce a cylindrical or drum-like mold. These laminae are apertured from side to side therethrough, rather than from an edge thereof. FIGS. 21 and 22 are schematic, in that they show the topmost plate 136 as provided with holes 140, 141 and 142 in spaced progression, these holes being respectively rectangular, circular and triangular in shape; while the next lamina 137 has similar holes 140', 141' and 142', respectively, in a similar transverse spacing; and the third lamina 138 in turn has like shaped apertures 140'', 141'' and 142'' correspondingly spaced. FIG. 22 shows further variations in the respective plate apertures, as will be described.

While it is unlikely that the specifically different type of plate holes schematically shown in FIGS. 21 and 22 will be employed in any given mold, nevertheless, these views show the wide variation of molding cavity outlines which may be built into a laminated mold in which the cavity formations extend from side-to-side of the constituent laminae rather than from edges thereof.

Thus, with the through-openings respectively aligned with one another in the fashion of FIG. 22, it is seen that the rectangular openings 140, 140', 140'' may be of identical cross sectional area and shape. This results in a mold cavity 144 (FIG. 22) of uniform cylindrical cross section; and accordingly a pile element of corresponding uniform cross section throughout its length will result, the cross section being determined by the shape of the apertures, and, of course, not necessarily rectangular.

On the other hand, the openings may be of varying cross sectional area, though uniform in respect to their shape, circular or otherwise. Thus, the openings 141, 141' and 141'' may be of frusto-conical shape and differing diameter, their outlines merging progressively with one another to provide a composite cavity 145 which is itself of elongated frusto-conical shape.

On the other hand, a stepped but generally pyramidal cavity 146 may be produced by shaping another set of plate apertures, 142, 142' and 142'', in a similar shape but of progressively diminishing area, so that a pile element molded therein will have a generally pyramidal outline. Similarly, a generally conical pile element may be formed by making holes 142, 142' and 142'' of curvilinear cross sectional outline.

In any form, the mold laminae 136, 137, 138 will be assembled to a base lamination 143 closing the ends of the cavities, as shown in FIG. 22.

Of whatever shape and size they may be, the plate cavity defining holes described above may be readily and economically formed in the laminae by punching, drilling or other known machine operation, by etching as in the production of printing plates, or by other known method of perforating. Pile elements formed in the cavities 144, 145 or 146 tend to attain a smoothly rounded peripheral surface, particularly in a stepped configuration such as the cavity 146. As in the other embodiments, air or gas evolved in the molding or hardening procedure may escape between mating surfaces of the laminations, thus preventing surface marring of the pile elements, be they of elongated filament like character or more blunt in outline. All other advantages described above are attain-

able in the use of a mold such as the mold 135 of FIG. 22.

From the above method and apparatus considerations, it is to be noted that the invention encompasses the production of various types of pile-like material, exhibiting either relatively wide and blunt piling formations, or relatively elongated, filamentary formations, by steps in no way resembling the injection or high pressure procedures, or any other technique now or heretofore employed. Thus, the method is capable of being practiced in continuous production utilizing continuously rotating mold forming equipment constituted of component mold laminations. Yet, under controlled conditions, for example of temperature and pressure, the equipment is capable of an industrial production at a continuous high output rate of pile-like stock corresponding to or exceeding that of any of the above illustrated and described forms. A rate of 40 linear feet per minute is possible.

An important aspect of the present invention, in regard to method and apparatus, resides in the fact that the assembly of a lamination of notched mold plates permits air or other gas to escape during the molding and setting operation. Thus, there is no possibility of such gas accumulation tending to mar the individual outlines of the pile elements or components, in any embodiment of the product. It follows that the latter is uniformly perfect in regard to the contour and size of its individual pile members, whatever such size and shape may be.

While the invention is not to be regarded as specifically limited in reference to dimensional size of the pile elements, nevertheless, for the sake of illustration, rather blunt pyramidal tuft formations, such as the formations 19, 30 and 45 of FIGS. 4, 4A and 6, may be considered as being of the order of, say, $\frac{1}{4}$ inch along the direction of the apex thereof, about the same dimension in the longitudinal direction of a row of formations, and in the neighborhood of $\frac{1}{8}$ inch or less in height. Such a pile-like product will constitute an excellent multi-directionally flexible, anti-slip shoe sole, or other anti-friction cushion structure such as a floor mat.

On the other hand, in the much more finely pile-like products illustrated in FIGS. 12, 12A, 13, 13A, 14A, 15B, 15C, 16B and 16C, the base dimension of the slim, filament-like pile elements will be of the order of, say, less than $\frac{1}{16}$ inch by about $\frac{1}{32}$ inch, and of a height of about $\frac{1}{8}$ inch. Such a product is adapted to a multitude of uses, for example, gloves, highly cushioned floor matting, bathing caps, and the like, in any of which adaptations the highly populationed nature of the piling makes possible many attractive visual and textural effects, as by the procedures described in connection with FIGS. 13 and 13A, FIGS. 15B and 15C, and FIGS. 16B and 16C, and with or without aperturing of the base, as suggested in FIGS. 4A and 4B.

While the mold in various embodiments herein illustrated and described exhibits a series of plate-like laminae having the desired pile forming provisions, those skilled in the art will perceive the possibility of constructing a mold having similar capabilities by the use of a continuous strip wound helical-wise to bring successive laminae portions in side-by-side engagement with one another, such portions having mold formations formed therein either prior to or during the winding operation. Accordingly, unless more specifically claimed, the terms "lamina" and "laminae" are to be construed as applying to such a variation. The same is true of other variant procedural and/or structural modifications which will suggest themselves to those skilled in the art.

As appears from the foregoing, the invention is also not to be regarded as limited by the specific nature of material to be molded, which may be an amorphous one of any of a wide variety of types, of which only general categories have been mentioned above. This consideration is determined mainly by the particular characteristic or characteristics of the product which are desired to be

15

attained. To enumerate specific examples of materials suitable for the multiple objectives herein mentioned would uselessly burden this application. Qualities of known molding materials appropriate to the purposes are familiar to those having ordinary skill in the art.

The drawings and the foregoing specification constitute a description of the improved pile-like material and process and apparatus for making same in such full, clear, concise and exact terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claim.

What I claim as my invention is:

A pile-like molded product, comprising a base having a plurality of parallel rows of pile formations of pyramidal shape integrally formed on and projecting from a surface thereof, the formations of the respective transversely successive rows being staggered relative to one another in the longitudinal direction of said rows, said base having apertures therethrough separating some of the pile formations of the respective rows from one another, the apertures of a given row being in transverse alignment with pile formations of an adjacent row and being overlapped longitudinally by the ends of such pile formations, the respective pile formations of said given

16

and adjacent rows also longitudinally overlapping one another to provide an integral connection of said respective pile formations at the overlapped portions thereof.

References Cited by the Examiner

UNITED STATES PATENTS

2,245,047	6/1941	Odell	
2,246,040	6/1941	Guild	161-66
2,306,732	12/1942	Huxham	18-44
2,315,721	4/1943	Martin	18-44
2,586,612	2/1952	Caldwell	4-187
2,816,853	12/1957	Meyers	161-63
2,971,245	2/1961	Feild et al.	161-62
3,027,595	4/1962	Takai et al.	264-284
3,055,357	9/1962	Redka	4-182
3,142,599	7/1964	Chavannes	
3,152,002	10/1964	Wisotsky et al.	
3,179,550	3/1965	Friedman	161-62
3,180,782	4/1965	Coates et al.	

ALEXANDER WYMAN, *Primary Examiner*.

R. H. Criss, *Assistant Examiner*.

APPENDIX IX

Serial No.: 09/955,604

Docket No.: 49933US032

1. Urdang et al., The Random House College Dictionary, New York, NY; Title page, Publication page, Table of Contents, and pg. 1228 (1973).

**THE
RANDOM
HOUSE**

College Dictionary

**RANDOM
HOUSE** 
DICTIONARIES

A widely acclaimed series of modern
authoritative dictionaries suitable for
many different needs and levels

Editorial Director: **Jess Stein**
Associate Director: **Leonore C. Hauck**
Senior Editor: **P.Y. Su**

Laurence Urdang
Editor in Chief
Stuart Berg Flexner
Managing Editor

Based on
**The Random House
Dictionary of the
English Language**
The Unabridged Edition
Jess Stein
Editor in Chief
Laurence Urdang
Managing Editor

Preface

IN THE DECADES recently past, especially since World War II, the educational standards of the world have been extended to embrace more people than ever before. Literacy has increased enormously. Coupled with the technological advances of the period, the necessity for reading and study has resulted in an unprecedented interest in words.

The dictionary has traditionally been the only source of information on language for the majority of people. In it they expect to find how a word is spelled, how it may be hyphenated, how it is pronounced, what its various forms are, what its meanings are, and what its origins and history are. They also expect to find whether a word is technical or general, whether it can be used in polite company or not, and even whether someone who is called a certain word is justified in feeling offended. They want unfamiliar objects illustrated and particular places pinpointed on maps; they want biographical information, geographical, demographic, and political data, abbreviations, symbols, synonyms, antonyms, usage notes—in short, people expect to find condensed between the covers of a dictionary the knowledge of the world as reflected in their language. Above all, they demand that this knowledge be accurate and up to date. Indeed, why not? The dictionary is often the only reference book of any kind that many people ever own.

That these prodigious demands are met is, of course, no accident. A dictionary is the product of specialists, linguists, and highly trained editors who are devoted to researching language and information and to interpreting it and presenting it in understandable form.

The *Random House College Dictionary* is an abridgment of *The Random House Dictionary of the English Language—The Unabridged Edition*, and its style follows that of the *RHD*. No dictionary, no matter how extensive, could record the entire English language. It is obvious, then, that the editors of any dictionary are compelled to exercise discretion in what is to be included. The goal cannot be completeness: the goal must be judicious selectivity. There is no dearth of re-

Copyright © 1973, 1972, 1969, 1968 by Random House, Inc.

All rights reserved under International and Pan-American Copyright Conventions. No part of this book may be reproduced in any form or by any means, electronic or mechanical, including photocopying, without permission in writing from the publisher. All inquiries should be addressed to Random House, Inc., 201 E. 50th Street, New York, N.Y. 10022.

Based on *The Random House Dictionary of the English Language—The Unabridged Edition* Copyright 1973, 1971, 1970, 1969, 1967, 1966 by Random House, Inc.

PUBLISHED IN THE UNITED STATES OF AMERICA BY RANDOM HOUSE, INC., NEW YORK AND SIMULTANEOUSLY IN CANADA BY RANDOM HOUSE OF CANADA LIMITED, TORONTO

A number of entered words which we have reason to believe constitute trademarks have been designated as such. However, neither the presence nor the absence of such designation should be regarded as affecting the legal status of any trademark.

Chart of Periodic Table of the Elements, Copyright © 1964 by E. H. Sargent & Co.

Table of Common Proofreader's Marks, Copyright 1950, © 1956 by Alfred A. Knopf, Inc.

b. o/hn

Library of Congress Catalog Card Number: 68-19699

Manufactured in the United States of America

Type set by R. R. Donnelley & Sons Company
Printed and bound by Rand McNally and Company

Table of Contents

Preface	v
Editorial Staff	vii
Consultant Staff	viii
Indo-European Language Chart	x
Historical Sketch of the English Language	xi
Etymology Key	xv
Pronunciation Key	xvi
Pronunciation of English	xvii
Usage, Dialects, and Functional Varieties	xix
Guide to the Dictionary	xxii
Table of Common English Spellings	xxxii
A DICTIONARY OF THE ENGLISH LANGUAGE	1

Signs and Symbols	1335
Directory of United States Colleges and Universities	1339

THE BRAND HOUSE Colleges Dictionary

Laurence Urdang,
Editor in Chief
Stuart Berg Flexner
Managing Editor

SENIOR EDITORS

Walter C. Kidney • Thomas Hill Long
• Ernie Pearson • Salvatore Ramondino
• Edwin M. Ripin • Eugene F.
Shewmaker • P. Y. Su • Sidney E.
Zimmerman

EDITORIAL ASSIS

Kerlin Gleason • J
• Paul Merrill • P
Lawrence E. Pitt
Potash • Sally G.
Rephan • Robert

EDITORS

Suzanne Grossman Berger • Harvey L.
Biller • Andrea C. Demson • P. Y. Su • M.
Friedberg • Janet R. Goldstein • Hazel
G. Kahn • Richard McDougall •
Margaret Miner • Bar-Kochba Shur

RESEARCH ASSIS

Elizabeth G. Clift
Dienhouse • Rlm
Heiple • Carolyn
Dorothy Gerner S

ASSISTANT EDITORS

Antoinette R. Balch • Valerie J. Clift
• James DeMott • Alice Kovac •
Suzanne Orgood • Constance Babouk

ADMINISTRATIVE

Marianne E. Greg
• Mary Sapounak

ARTISTS

1. pertaining to Ceylon, its native people, or their language. —n. 2. a member of the Sinhalese people. 3. an Indic language that is the language of most of Ceylon, including Colombo. Also, Sinhalese. [var. of Sinhalese < Skt Sinhala(a) Ceylon + -ese]
- single** (sɪŋɡl), *adj.*, *v.*, *glad.*, *gling*, *n.* —*adj.* 1. one only; only one in number; sole: a single example. 2. of, pertaining to, or suitable for one person only: a single bed. 3. unique; solitary: He was the single survivor. 4. unmarried. 5. pertaining to the unmarried state. 6. of one against one, as combat or fight. 7. consisting of only one part, element, or member: 8. sincere; honest; undivided: single devotion. 9. separate; individual. 10. uniform; applicable to all. 11. (of a flower) having only one set of petals. 12. *Brit.* of only moderate strength or body, as ale or beer. 13. (of the eye) seeing rightly. —*v.* 14. to pick or choose out from others (usually fol. by out): to single out a fact for special mention. 15. *Baseball*, *a.* to cause the advance of (a base runner) by a one-base hit. *b.* to cause (a run) to be scored by a one-base hit (often fol. by in). —*v.* 16. *Baseball*, to make a one-base hit. 17. *Obs.* (of a horse) to go at single-foot. —*n.* 18. one person or thing; a single one. 19. an accommodation for one person, as a hotel room, cabin on a ship, etc. 20. Also called one-base hit. *Baseball*, a base hit that enables a batter to reach first base safely. 21. *singles*, (constructed as sing.) a match with one player on each side. 22. *Golf*, twosome (def. 4). 23. *Crickets*, a hit for which one run is scored. 24. *Informal*, a one-dollar bill: a five and five singles. [late ME; ME *single* < MF < L *single* (us); see SIMPLE] —*Syn.* 1. distinct, particular. 4. unweaved. 14. select. 18. individual
- single-acting** (sɪŋɡl ˈæk tɪŋɡ), *adj.* (of a reciprocating engine, pump, etc.) having pistons accomplishing work only in one direction. Cf. double-acting (def. 1).
- single-action** (sɪŋɡl ˈæk tʃən), *adj.* (of a firearm) requiring the cocking of the hammer before firing each shot: a single-action revolver.
- single bond**, *Chem.* a chemical linkage consisting of one covalent bond between two atoms of a molecule, represented in chemical formulas by one line or two vertical dots, as C-H or C-H.
- single-breasted** (sɪŋɡl ˈbreɪst ɪd), *adj.* (of a garment, esp. a coat or jacket) having a single button or row of buttons in front for the center closure. Cf. double-breasted.
- single-cross** (sɪŋɡl ˈkrɒs), *n.* *Genetics*, a cross between two inbred lines.
- single cut**, *Jewelry*, a simple form of brilliant cut, having eight facets above and eight facets below the girdle. Also called half-brilliant cut.
- single-cut** (sɪŋɡl ˈkʌt), *adj.* noting a file having a series of parallel cutting ridges in one direction only.
- single entry**, *Bookkeeping*, a simple accounting system noting only amounts owed by and due to a business. Cf. double entry. —*single-entry*, *adj.*
- single file**, a line of persons or things arranged one behind the other: Indian file.
- single-foot** (sɪŋɡl ˈfʊt), *n.* 1. *rack*. —*v.* 2. (of a horse) to go at a rack.
- single-handed** (sɪŋɡl ˈhænd ɪd), *adj.* 1. accomplished or done by one person alone; unaided. 2. having, using, or requiring the use of only one hand or one person. —*adv.* 3. by oneself; alone; without aid. —*single-handed-ly*, *adv.* —*single-handed-ness*, *n.*
- single-hearted** (sɪŋɡl ˈhɑːrt ɪd), *adj.* sincere and undivided in feeling or spirit; dedicated.
- single-minded** (sɪŋɡl ˈmaɪnd ɪd), *adj.* 1. having or showing a single aim or purpose: a single-minded program. 2. dedicated; steadfast. —*single-minded-ly*, *adv.* —*single-minded-ness*, *n.*
- single-ness** (sɪŋɡl ˈnɪs), *n.* the state or quality of being single.
- single-phase** (sɪŋɡl ˈfæz), *adj.* *Elec.* noting or pertaining to a circuit having an alternating current with one phase or with phases differing by 180°.
- single quotes**, one pair of single quotation marks, written as (') and used esp. for a quotation within another quotation: He said, "I told you to say 'Open sesame' when you want to enter the mountain." Cf. double quotes.
- single-shot** (sɪŋɡl ˈʃɒt), *adj.* (of a firearm) requiring loading before each shot; not having a cartridge magazine.
- single-space** (sɪŋɡl ˈspeɪs), *v.*, *spaced*, *spacing*. —*v.* 1. to type (copy) on each line space. —*v.* 2. to type copy leaving no blank spaces between lines.
- single Spanish burton**, a tackle having a runner as well as the fall supporting the load. See *diag.* at *tackle*.
- single stand**, *ard*, 1. a single set of principles or rules applying to everyone, as a single moral code applying to both men and women. Cf. double standard. 2. monometalism.
- single-stick** (sɪŋɡl ˈstɪk), *n.* 1. a short, heavy stick. 2. (formerly) a wooden stick held in one hand, used instead of a sword in fencing. *b.* fencing with such a stick.
- single-tie** (sɪŋɡl ˈti), *n.* *Chiefly Brit.* a man's undershirt or jersey.
- single tape**, See under *magnetic tape*.
- single tax**, *Econ.* a tax, as on land, that constitutes the sole source of public revenue. —*single-tax*, *adj.*
- single-ton** (sɪŋɡl ˈtɒn), *n.* 1. something occurring singly. 2. *Cards*, a card that is the only one of a suit in a hand.
- single-track** (sɪŋɡl ˈtræk), *adj.* having a narrow scope; one-track: a single-track mind.
- single-tree** (sɪŋɡl ˈtri), *n.* whiffletree. [var. of WHISTLETREE]
- single whip**, See under *whip* (def. 20). See *diag.* at *tackle*.
- single** (sɪŋɡl), *adv.* 1. apart from others; separately. 2. one at a time; as single units. 3. single-handed; alone. [ME *sengely*]
- sing-song** (sɪŋɡ ˈsɒŋ, -sɒŋ), *n.* 1. verse, or a piece of verse, of a jingling or monotonous character. 2. monotonous rhythmical cadence, tone, or sound. 3. *Brit.* a group sing. —*adj.* 4. monotonous in rhythm.
- sing-spell** (sɪŋɡ ˈspɛl), *Ger.* *zing* (ʃpɛl), *n.* a German opera, esp. of the 18th century, using spoken dialogue. [C. G. lit., sing-play]
- singular** (sɪŋɡjʊlə), *adj.* 1. extraordinary; remarkable; exceptional: a singular success. 2. unusual or strange; odd; different: singular behavior. 3. being the only one of its kind; unique: a singular example. 4. separate; individual. 5. *Gram.* noting or pertaining to a member of the category of number indicating that a word form has one referent or denotes one person, place, thing, or instance, as boy, a singular noun, or goes, a singular form of the verb. Cf. dual (def. 4). 6. *Logic*, of or pertaining to something individual, specific, or not general. 7. *Obs.* personal; private. 8. *Obs.* single. —*n.* *Gram.* 9. the singular number. 10. a form in the singular. [ME < L *singularis* (s). See *SINGLE*, -*AR*] —*sin-gu-lar-ly*, *adv.* —*Syn.* 1-4. peculiar. 2. bizarre, queer, curious. 3. uncommon, rare. —*Ant.* 1. usual.
- sin-gu-lar-ize** (sɪŋɡjʊlə ˈraɪz), *v.*, *used*, *Chiefly Brit.* singularize. —*sin-gu-lar-ize*, *n.*
- sin-gu-lar-ity** (sɪŋɡjʊlə ˈrɪtɪ), *n.* *pl.* -ities for 2. 1. the state, fact, or quality of being singular. 2. a singular, unusual, or unique quality. [ME *singularitate* < LL *singularitas*]
- sin-gu-lar-ize** (sɪŋɡjʊlə ˈraɪz), *v.*, *used*, *Chiefly Brit.* to make singular. Also, esp. *Brit.*, *singularize*. —*sin-gu-lar-ize*, *n.*
- sinh** (sɪŋ), *n.* *Math.* hyperbolic sine. [SIN(x) + H (HYPERBOLIC)]
- Sin-ha-lese** (sɪn ˈhə ˈleɪz, -ləs), *adj.*, *n.*, *pl.* -lese. *Singha-lese*
- Sin-i-cism** (sɪn ˈiːz ɪzəm), *n.* something characteristic of or peculiar to the Chinese. [*Sin* Chinese (< ML *Sinicus*) < MGk *Sinikos* = LGk *Sin*(at) the Chinese + (-*ikos*-ic) + (-*ism*)]
- Sin-ing** (sɪn ˈɪŋ), *n.* a city in and the capital of Ching-hai, in W China, 300,000 (est. 1957). Also, *Heinang*.
- sin-ist-er** (sɪn ˈɪstər), *adj.* 1. threatening or portending evil, harm, or trouble; ominous. 2. malevolent; evilly intended. 3. *Heraldry*, noting the side of an escutcheon or achievement of arms that is to the left of the hypothetical bearer (opposed to *dexter*). 4. *Archaic*, of or on the left side; left. [late ME < L: on the left hand or side, hence unfavorable, injurious (from the Roman belief that unfavorable omens appear on one's left)] —*sin-ist-er-ly*, *adv.* —*Syn.* 1. inauspicious, portentous. —*Ant.* 1. benign.
- sinist-er**, a learned borrowing from Latin meaning "left," "on the left," used in the formation of compound words: *sinistrous*. Also, esp. before a consonant, *sinistrous*. [C. L. *sinistr-*, *s.* of *sinister*]
- sin-is-tral** (sɪn ˈɪstrəl), *adj.* 1. of, pertaining to, or on the left side; left (opposed to *dextral*). 2. left-handed. [late ME < ML *sinistralis*] —*sin-is-tral-ly*, *adv.*
- sin-is-tro-gy-ration** (sɪn ˈɪstrə ˈdʒɪ ˈrʃən, sɪ nɪs ˈtrə-), *n.* *Optics*, *Chem.* levorotation. —*sin-is-tro-gy-ric* (sɪn ˈɪstrə ˈtrɪk), *adj.*
- sin-is-tro-verse** (sɪn ˈɪstrə ˈvɜːs, sɪ nɪs ˈtrə ˈvɜːs), *adj.* *Bot.* (from a point of view at the center of the spiral) rising spirally from right to left, as a stem (opposed to *dextroverse*). [C. L. *sinistrorsus* (us), lit., turned leftwards, contr. of **sinistrorsus*, var. of **sinistrorsus*. See *SINISTRO*, *VERSUS*]
- sin-is-trous** (sɪn ˈɪstrəs), *adj.* 1. ill-omened; unlucky; disastrous. 2. *sinistral*; left. —*sin-is-trous-ly*, *adv.*
- Sin-ni-tic** (sɪn ˈɪtɪk), *n.* 1. a branch of Sino-Tibetan consisting of the various local languages and dialects whose speakers share literary Chinese as their standard language. —*adj.* 2. of or pertaining to the Chinese, their language, or their culture. [C. L. *Sin(ae) Chinese* (< LGk *Sinai*) + (-*tic*)]
- sink** (sɪŋk), *v.*, *sank* or, often, *sunk*; *sunk* or *sunk-en*; *sink-ing*; *n.* —*v.* 1. to fall, drop, or descend gradually to a lower level. 2. to go down toward or below the horizon. 3. to slope downward; dip. —*v.* 4. to displace the volume of an underlying substance or object and become submerged or partially submerged (often fol. by in or into): The battleship sank within two hours. His foot sank in the mud. 5. to fall or collapse slowly from weakness, fatigue, etc. 6. to become absorbed in or gradually to enter a state or condition (usually fol. by in or into): to sink into slumber. 7. to pass or fall into some lower state or condition. 8. to fall in physical strength or health. 9. to become lower in loudness, tone, or pitch. 10. to enter or permeate the mind; become known or understood (usually fol. by in or into): I repeated it till the words sank in. 11. to become hollow, as the cheeks. 12. to sit, recline, or lie (usually fol. by down, in, on, etc.): He sank down on the bench. —*v.* 13. to cause to fall, drop, or descend gradually. 14. to cause to become submerged. 15. to lower or depress the level of. 16. to bury, plant, or lay (a pipe, conduit, etc.) into or as into the ground. 17. to bring to a worse or lower state or status. 18. to reduce in amount, extent, intensity, etc. 19. to lower in loudness, tone, or pitch. 20. to invest in the hope of making a profit or gaining some other return. 21. to dig, bore, or excavate (a hole, shaft, well, etc.). —*n.* 22. a basin or receptacle connected with a water supply, used for washing. 23. a low-lying, poorly drained area where waters collect or disappear by sinking down into the ground or by evaporation. 24. sinkhole (def. 2). 25. a place of vice or corruption. 26. a drain or sewer. 27. any pond or pit for sewage or waste, as a cesspool or a pool for industrial wastes. [ME; OE *sincan*]; c. D *zinken*, G *sinken*, Icel *sinkta*, Goth *singan*]
- sink-age** (sɪŋk ˈɪdʒ), *n.* the act, process, or an amount of sinking.
- sink-er** (sɪŋk ˈkər), *n.* 1. a person or thing that sinks. 2. a person employed in sinking, as one who sinks shafts. 3. a weight, as of lead, for sinking a fishing line or net below the surface of the water. 4. *Slang*, a doughnut.
- sink-hole** (sɪŋk ˈhɒl), *n.* 1. a hole formed in soluble rock by the action of water, serving to conduct surface water to an underground passage. 2. Also called sink, a depressed area in which waste or drainage collects. [ME]
- Sin-kiang** (sɪn ˈkɪŋɡ, Chin. *shin ˈkɪŋɡ*), *n.* the westernmost division of China, bordering Tibet, India, the Soviet Union, and Mongolia; formerly a province, 5,640,000 (est. 1957); 635,829 sq. mi. *Cap.* Urumchi. Official name, *Sin-kiang-Ui-gur Auton/omous Re-gion* (sin ˈkɪŋɡ ˈwɛ ˈgər, -gər; Chin. *shin ˈkɪŋɡ ˈwɛ ˈgər*).
- sink-ing fund**, a fund to extinguish an indebtedness, usually a bond issue.
- sink-ing spell**, a temporary decline, as in health.
- sin-less** (sɪn ˈlɪs), *adj.* free from or without sin. [ME *sinles*, OE *synleas*]
- sinner** (sɪn ˈər), *n.* a person who sins; transgressor. [ME]

APPENDIX X.

Serial No.: 09/955,604

Docket No.: 49933US032

1. Hybritech Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 231 U.S.P.Q. 81 (Fed. Cir. 1986) cert. denied, 480 U.S. 947 (1987).
2. In re Hoeksema, 399 F.2d 269, 158 U.S.P.Q. 596 (CCPA 1968).
3. M.P.E.P. § 2121.01.
4. M.P.E.P. § 2141.01.
5. In re Wesslau, 353 F.2d 238, 147 U.S.P.Q. 391 (CCPA 1965).
6. Bausch & Lomb, Inc. v. Barnes-Hind/Hycrocurve, Inc., 796 F.2d 443, 230 U.S.P.Q. 416 (Fed. Cir. 1986) cert. denied, 484 U.S. 823 (1987), on remand, 10 U.S.P.Q. 2d 1929 (N.D. Calif. 1989).
7. In re Gorman, 933 F.2d 982, 18 U.S.P.Q.2d 1885 (Fed. Cir. 1991).
8. In re Dow Chem., 837 F.2d 469, 5 U.S.P.Q.2d 1529 (Fed. Cir. 1988).

Hybritech Incorporated v. Monoclonal Antibodies, Inc.

(CA FC)

231 USPQ 81

Decided September 19, 1986

No. 86-531

U.S. Court of Appeals Federal Circuit

Headnotes

PATENTS

1. Patentability -- In general (§ 51.01)

Federal district court's finding that evidence was lacking as to when, before May 1980, claimed invention of using monoclonal antibodies in "sandwich" assays was conceived by patent holder, is clearly erroneous, in view of evidence demonstrating patent holder's earlier efforts in developing claimed invention by using prior art technology to produce necessary monoclonal antibodies in diagnostic sandwich assay kits, in view of evidence demonstrating that exploiting monoclonal antibodies for use in sandwich assays was one of patent holder's major objectives, and in view of laboratory notebooks and research program that fully corroborate testimonial evidence of conception, since such evidence clearly supports holding that patent holder conceived claimed invention before patent challenger and that patent challenger's work is not prior art.

2. Patentability -- Anticipation -- In general (§ 51.201)

Prior art work that involved "sandwich" assay to extent that antigen was sandwiched between two monoclonal antibodies, but that did not involve detecting presence of or quantitating antigen, did not anticipate claimed invention, since it did not meet its every element.

3. Patentability -- Invention -- In general (§ 51.501)

Articles which "predicted" widespread use of monoclonal antibodies but which are dated well after patented monoclonal assay's date of conception and within one year of its

filing date, are not prior art, nor should earlier articles which discussed production of monoclonal antibodies, although clearly prior art, have been relied upon to establish obviousness of trying monoclonal antibodies of particular affinity in "sandwich" immunoassay that detects presence of or quantitates antigen, since such articles do not suggest how that end may be accomplished, and since "obvious to try" is improper consideration in adjudicating obviousness issue.

4. Patentability -- Evidence of -- Commercial success -- Causes (§ 51.4555)

Trial court's finding that "sudden availability" of monoclonals was reason for commercial success of patented diagnostic kits is clearly erroneous, in view of evidence demonstrating that at least three years passed between time monoclonal antibodies were available in adequate supply and time patent holder began selling its kits.

5. Claims -- Indefinite -- Chemical (§ 20.553)

Federal district court erred in holding that claims for monoclonal assay are indefinite because antibody affinity cannot be estimated with any consistency, since calculating affinity was known in art at time of filing, and since such claims reasonably apprise those skilled in art and are as precise as subject matter permits, even though calculations are not precise or "standard."

Particular patents -- Assays

4,376,110, David and Green, Immunometric Assays Using Monoclonal Antibodies, holding of invalidity reversed.

Case History and Disposition:

Page 81

Appeal from District Court for the Northern District of California, Conti, J.; 227 USPQ 215 .

Action by Hybritech Incorporated, against Monoclonal Antibodies, Inc., for patent infringement. From judgment for defendant, plaintiff appeals. Reversed and remanded.

Attorneys:

Douglas E. Olson, and Lyon & Lyon, both of Los Angeles, Calif. (James W. Geriak and Bradford J. Duft, both of Los Angeles, Calif., on the brief) for appellant.

David J. Brezner, and Flehr, Hohback, Test, Albritton & Herbert,

both of San Francisco , Calif. (Barry E. Britschneider and Herbert I. Cantor, both of Washington, D.C., of counsel) for appellee.

Judge:

Before Rich, Davis, and Smith, Circuit Judges.

Opinion Text

Opinion By:

Rich, Circuit Judge.

This appeal is from the August 28, 1985, decision of the United States District Court for the Northern District of California, 623 F.Supp. 1344, 227 USPQ 215 , in favor of defendant Monoclonal Antibodies, Inc. (Monoclonal) holding that all 29 claims of plaintiff's patent No. 4,376,110 entitled "Immunometric Assays Using Monoclonal Antibodies" ('110 patent), issued to Dr. Gary S. David and Howard E. Greene and assigned to Hybritech Incorporated (Hybritech), are invalid as anticipated under 35 USC 102(g), for obvious

Page 82

ness under §103, and under §112 first and second paragraphs. We reverse and remand.

Background

Vetebrates defend themselves against invasion by microorganisms by producing antibodies, proteins which can complex with the invading microorganisms and target them for destruction or removal. In fact, any foreign molecule of sufficient size can act as a stimulus for antibody production. Such foreign molecules, or antigens, bear particular sites or epitopes that represent antibody recognition sites. B cell lymphocytes, the cells that actually produce antibodies, recognize and respond to an epitope on an antigen by reproducing or cloning themselves and then producing antibodies specific to that epitope. Even if the antigen is highly purified, the lymphocytes will produce antibodies specific to different epitopes on the antigen and so produce antibodies with different specificities. Furthermore, because the body is exposed to many different antigens, the blood of a vertebrate will contain antibodies to many different antigenic substances.

Scientists and clinicians have long employed the ability of antibodies to recognize and complex with antigens as a tool to identify or label particular cells or molecules and to separate them from a mixture. Their source of antibodies has been primarily the serum separated from the blood of a vertebrate immunized or exposed to the antigen. Serum, however, contains a mixture of antibodies directed to numerous antigens and to any number of epitopes on a particular antigen. Because such a mixture of antibodies arises from many different clones of lymphocytes, it is called "polyclonal."

Recent technological advances have made it possible to isolate and cultivate a single clone of lymphocytes to obtain a virtually unlimited supply of antibodies specific to one particular epitope. These antibodies, known as "monoclonal antibodies" because they arise from a single clone of lymphocytes, are produced by a relatively new technology known as the hybridoma. Hybridomas are produced by fusing a particular cancer cell,

the myeloma cell, with spleen cells from a mouse that has been injected or immunized with the antigen. These fusions are isolated by transferring them to a growth fluid that kills off the unfused cancer cells, the unfused spleen cells dying off by themselves. The fused hybrid spleen and myeloma cells, called hybridomas, produce antibodies to the antigen initially injected into the mouse. The growth fluid containing the hybridomas is then diluted and put into individual test tubes or wells so that there is only one hybridoma per tube or well. Each hybridoma then reproduces itself and these identical hybridomas each produce identical monoclonal antibodies having the same affinity and specificity. In this way, a virtually unlimited supply of identical antibodies is created, directed to only one epitope on an antigen rather than, as with polyclonal antibodies, to many different epitopes on many different antigens.

In addition to the specificity of antibodies to particular epitopes discussed above, antibodies also have a characteristic "sensitivity," the ability to detect and react to antigens. Sensitivity is expressed in terms of "affinity:" the greater an antibody's ability to bind with a particular antigen, the greater the antibody's affinity. The strength of that antibody-antigen bond is in part dependent upon the antibody's "affinity constant," expressed in liters per mole, for the antigen.

Immunoassays, the subject matter of the '110 patent are diagnostic methods for determining the presence or amount of antigen in body fluids such as blood or urine by employing the ability of an antibody to recognize and bind to an antigen. Generally, the extent to which the antibody binds to the antigen to be quantitated is an indication of the amount of antigen present in the fluid. Labelling the antibody or, in some cases, the antigen, with either a radioactive substance, I 125, or an enzyme makes possible the detection of the antibody-antigen complex. In an extreme case, where the fluid sample contains a very low level of the antigen, binding might not occur unless the antibodies selected or "screened" for the procedure are highly sensitive.

In the case of a "competitive" immunoassay, a labelled antigen reagent is bound to a limited and known quantity of antibody reagent. After that reaction reaches equilibrium, the antigen to be detected is added to the mixture and competes with the labelled antigen for the limited number of antibody binding sites. The amount of labelled antigen reagent displaced, if any, in this second reaction indicates the quantity of the antigen to be detected present in the fluid sample. All of the antigen attached to the antibody will be labelled antigen if there is no antigen in the test fluid sample. The advantage of this method is that only a small amount of antibody is needed, its drawback, generally, that the system must reach equilibrium, and thus produces results slowly.

In the case of a "sandwich" assay, otherwise known as an immunometric assay, the latter being a term coined by Dr. Lawton Miles in 1971, a quantity of unlabelled antibody reagent is bound to a solid support surface such as the inside wall of a test tube containing a complex of the fluid sample containing the

Page 83

antigen to be detected and a labelled *antibody* reagent. The result is an insoluble three part complex referred to as a sandwich having antibody bread and antigen filling. This figure is illustrative of the sandwich concept:

Tabular, graphic, or textual material set at this point is not available. Please consult hard copy or call BNA PLUS at 1-800-452-7773 or 202-452-4323.

The advantage of the sandwich assay is that it is fast and simple, its drawback that enormous quantities of antibodies are needed.

Hybritech

Hybritech, started in 1978 and joined thereafter by coinventors Green and Dr. David, has, since 1979, been in the business of developing diagnostic kits employing monoclonal antibodies that detect numerous antigens and thus a broad range of conditions such as pregnancy, cancer, growth hormone deficiency, or hepatitis. Examples of antigens include influenza viruses, immunoglobulin E (IgE) which indicates allergic reaction, human chorionic gonadotropin (HCG) which indicates pregnancy, and prostatic acid phosphatase (PAP) which indicates prostate cancer, to name a few. Dr. Adams, a business-experienced scientist, joined the company in May 1980 as head of research and development. The '110 patent, application for which was filed August 4, 1980, issued March 8, 1983, with claims defining a variety of sandwich assays using monoclonal antibodies. Claim 19, apparently the broadest of the twenty-nine in the patent, is directed generally to a sandwich assay and reads (emphasis ours):

19. In an *immunometric assay* to determine the presence or concentration of an antigenic substance in a sample of a fluid comprising forming a ternary complex of a first labelled antibody, said antigenic substance, and a second antibody said second antibody being bound to a solid carrier insoluble in said fluid wherein the presence of the antigenic substance in the samples is determined by measuring either the amount of labelled antibody bound to the solid carrier or the amount of unreacted labelled antibody, *the improvement comprising* employing monoclonal antibodies having an affinity for the antigenic substance of at least about 10⁸ liters/mole for each of said labelled antibody and said antibody bound to a solid carrier.

Claim 1, directed particularly to a reverse sandwich assay, explained infra, reads:

1. A process for the determination of the presence of [sic, or] concentration of an antigenic substance in a fluid comprising the steps:
 - (a) contacting a sample of the fluid with a measured amount of a soluble first monoclonal antibody to the antigenic substance in order to form a soluble complex of the antibody and antigenic substance present in said sample, said first monoclonal antibody being labelled;
 - (b) contacting the soluble complex with a second monoclonal antibody to the antigenic substance, said second monoclonal antibody being bound to a solid carrier, said solid carrier being insoluble in said fluid, in order to form an insoluble complex of said first monoclonal antibody, said antigenic substance and said second monoclonal antibody bound to said solid carrier;
 - (c) separating said solid carrier from the fluid sample and unreacted labelled antibody;
 - (d) measuring either the amount of labelled antibody; associated with the solid carrier or the amount of unreacted labelled antibody; and
 - (e) relating the amount of labelled antibody measured with the amount of labelled antibody measured for a control sample prepared in accordance with steps (a)-(d), said control sample being known to be free

of said anti-genic substance, to determine the presence of antigenic substance in said fluid sample, or relating the amount of labelled antibody measured with the amount of labelled antibody measured for samples containing known amounts of antigenic substance prepared in accordance with steps (a)-(d) to determine the concentration of antigenic substance in said fluid sample, the first and second monoclonal antibodies having an affinity for the antigenic substance of at least about 10⁸ liters/mole.

The District Court Decision

Hybritech sued Monoclonal March 2, 1984, for damages and an injunction alleging that the manufacture and sale of Monoclonal's diagnostic kits infringed the '110 patent. Trial without a jury began on August 5, 1985, and concluded August 23, 1985, thirty witnesses having been heard and over 2,000 pages of transcript generated. The district court produced the reported opinion, findings, and con

Page 84

clusions, which use nearly verbatim Monoclonal's *pre-trial* brief and *pre-trial proposed* findings of fact and conclusions of law, in three days, in support of the judgment now on appeal.

The district court held that the claimed subject matter of the '110 patent was neither conceived nor actually reduced to practice before May 1980, and was anticipated under §102(g) by the actual reduction to practice of the invention by Drs. Uotila and Ruoslahti at the La Jolla Cancer Research Foundation (LJCRF) as early as November of 1979 and by the actual reduction to practice of the invention by Drs. Oi and Herzenberg (Oi/Herzenberg work) at the Stanford University Laboratory as early as July 1978, later published in December of 1979.

The district court also held the claims of the '110 patent invalid for obviousness from the Oi/Herzenberg work in view of (1) a February 1979 article by M. E. Frankel and W. Gerhard (Frankel article) which discloses high-affinity monoclonal antibodies, and apparently in view of numerous other references including (2) the work of Nobel Prize winners G. Kohler and C. Milstein disclosing a Nobel Prize-worthy method for producing monoclonal antibodies in vitro (outside the body) published in an August 7, 1975, article; (3) U.S. Patent No. 4,244,940 issued to Jeong et al. disclosing a simultaneous polyclonal assay (Jeong), U.S. Patent No. 4,098,876 to Piasio et al. disclosing a reverse polyclonal sandwich assay (Piasio), U.S. Patent No. 4,016,143 to Schurrs et al. disclosing a forward polyclonal sandwich assay (Schurrs); (4) a July 1979 publication by A. C. Cuello et al. disclosing the use of monoclonal antibodies in competitive assays; and (5) eight articles dated between January 1979 and March 6, 1980, "predicting" that monoclonal antibodies would be used in future immunoassays.¹

The district court also invalidated the patent on various grounds based on 35 USC 112, first and second paragraphs, as hereinafter discussed.

A. The References

1. Kohler and Milstein's Nobel Prize-Winning Work: Producing Monoclonal Antibodies In Vitro For the First Time

In early immunoassay work, polyclonal antibodies produced in vivo (in the body) in mice were used to bind with the antigen to be detected in the body fluid sample. Mice

were immunized by injection with antigen so that the lymphocytes in their bodies produced antibodies that attacked the injected antigen. Those polyclonal antibodies were withdrawn from the animal's blood and used in immunoassays. The major problem was that when the mice's immune systems changed or the mice died, the antibodies changed or died too; supply was limited and uncertain.

As the examiner was aware, Kohler and Milstein developed a technique not only for producing antibodies in vitro, independent of a living body, thus eliminating dependence on a particular animal, but for in vitro production of monoclonal antibodies by hybridomas, discussed in the Background section, supra.

Given that sandwich assays require enormous amounts of antibodies, companies like appellant and appellee, which utilize monoclonal antibodies for sandwich assays, would not be in business were it not for the work of Kohler and Milstein.

2. The Work of Drs. Ruoslahti, Uotila, and Engvall at the La Jolla Cancer Research Foundation (LJCRF) in 1979 and 1980

Dr. Ruoslahti performed mostly competitive immunoassays using polyclonal antibodies to alphafetoprotein (AFP) antigens at the City of Hope since 1970. Dr. Uotila joined him in late 1978 to perform immunoassays using monoclonal antibodies to AFP. After producing monoclonal antibodies to AFP and performing competitive radio immunoassays (RIA -- a competitive assay that uses a radioactive label) with monoclonal antibodies at the City of Hope in mid-1979, Drs. Ruoslahti, Uotila and Engvall left LJCRF.

In the fall of 1979, September or October according to Dr. Uotila, discussion and work began on using monoclonal antibodies to AFP in a sandwich assay. Dr. Uotila, the principal researcher in this particular endeavor, generated six notebooks while at the City of Hope and LJCRF. The next-to-last page of notebook four contained a note to Dr. Uotila from Dr. Ruoslahti reading:

Sometime you should enzyme label a good monoclonal antibody so that you can set up a sandwich assay. If you use two monoclonal antibodies, you may be able to do the assay with a single incubation, since the monoclonal antibodies are likely to be

Page 85

directed against different determinants and not compete with one another. Although Dr. Uotila's notebook pages were, for the most part, unsigned, undated, and uncorroborated, Dr. Ruoslahti's testimony, placed the date of this note at about October 1979 by referring to the first pages of notebook five which were dated in early November 1979. Dr. Ruoslahti testified that one curve on one graph on page 43D of notebook five showed a successful simultaneous sandwich assay using monoclonal antibodies about November 5, 1979, although no data supporting that graph could be found elsewhere in the notebook. He further testified that the affinity of the monoclonal antibodies used for that test was not calculated until 1980 but that the raw data necessary for that calculation was generated in 1979.

Dr. Uotila stated in her deposition (she did not testify at trial) that she started work on a sandwich assay using monoclonal antibodies between October 4 and the end of that month, 1979, and that she could not remember the procedure used nor was there enough

information in her notebook, including page 43D, to refresh her memory. She did remember, although she continued work on this assay because the tests did not yield repeatedly good curves without which she would not publish her work, that the assay on page 43D was successful. Dr. Engvall testified about a discussion of Dr. Uotila's monoclonal antibody work with her while at the City of Hope and about first performing a sandwich assay after arriving at LJCRC in 1979.

3. The Work of Drs. Oi and Herzenberg at the Stanford University Laboratory in 1978 Published in December 1979

Drs. Oi and Herzenberg used monoclonal antibodies to "map" epitopes or determine the number and location of different antibody binding sites on a known quantity of IgE antigen by attaching to it an antibody bound to a carrier and exposing that antigen to other monoclonal antibodies. The antibodies either attached to epitopes on the antigen or were blocked from doing so by the other monoclonal antibodies, depending on the location and number of epitopes; if the epitopes on the antigen were too close together and the number of antibodies too great, few antibodies would bind to the antigen. Hybritech points out that both Dr. Herzenberg and Dr. Oi testified that *their work did not involve determining the presence or quantity of antigen*, that they had no idea what the affinities of the monoclonal antibodies used were, and that those values were never calculated.

One unsigned, unwitnessed page from three large laboratory notebooks, which Hybritech argues is insufficient because it does not identify the chemical reagents or protocol used, was relied on by Monoclonal to establish actual reduction to practice of the Oi/Herzenberg work in 1978 to establish a case of §102(g) prior invention by another. The district court agreed with Monoclonal that the Oi/Herzenberg work anticipated the claimed invention and, in addition, combined this work with the Frankel publication to hold that the claimed subject matter was obvious under §103.

4. The Frankel Article: Monoclonal Antibodies Having Affinities of 10⁹ liters/mole

Frankel describes an RIA (radioimmunoassay) method for the rapid determination of affinity constants for monoclonal antibodies produced from hybridomas. The article states that the assay used is applicable only to antibodies with binding constants of about 10¹⁰ liters/mole and discloses the binding constants for antibodies to several closely related strains of influenza virus.

The district court found that Frankel disclosed monoclonal antibodies having the affinity constants claimed in the '110 patent, 10⁸ to over 10⁹ liters/mole.

5. The Cuello Article and the Jeong, Piasio, and Schurr Patents Considered by the Examiner

Cuello, dated July 1979, states that it describes the usefulness of monoclonal antibodies in the characterization and localization of neurotransmitters such as Substance P, a peptide clearly associated with the transmission of primary sensory information in the spinal cord. The article discloses producing monoclonal antibodies from hybrid myelomas (hybridomas), their use in conventional radioimmunoassay techniques, and the benefits from doing so which flow from the ability to derive permanent cell lines capable of continuous production of highly specific antibodies.

The district court found that the examiner twice rejected all of the claims of the '110

patent based on Cuello alone or in combination with the Jeong, Piasio, and Schurr references which disclose various sandwich assays using polyclonal antibodies. The court also found that the examiner allowed the claims after they were amended to include the 10⁸ affinity limitation and after Richard Bartholomew, a Hybritech employee, submitted an affidavit alleging the advantages of using monoclonal rather than polyclonal antibodies in sandwich assays.

Apparently based on the testimony of Monoclonal's expert witness Judith Blakemore, a named inventor of the Jeong patent, manager of antibody programs at Bio-Rad Laboratories from 1975 to 1982, and currently manager of monoclonal antibody therapeutics at Cetus Corporation, a Hybritech competitor in immunoassay diagnostics, the district court stated

Page 86

that the "reasons for allowance were not well-founded because (1) the alleged advantages were expected as naturally flowing from the well-known natural characteristics of monoclonal antibodies . . . ; (2) . . . were not significant . . . ; or (3) were at best minor," although they were "argued to the examiner as if they were" important. These were Monoclonal's words from its pretrial submission adopted by the court.

6. *The References That "Predicted" the Use of Monoclonal Antibodies in Immunoassays*

The district court stated, again in Monoclonal's words, that "it is of the utmost importance" that the advantages of monoclonal antibodies were "predicted by a number of authorities," eight to be exact, not important enough to list here, after the Kohler and Milstein discovery and after monoclonal antibodies became available.

B. *The Claimed Subject Matter of the '110 Patent*

Hybritech argues that the district court's determination that there is no credible evidence of conception or reduction to practice of the '110 invention before May 1980 is error because Dr. David's laboratory notebooks, Nos. 21 and 24, clearly show successful sandwich assays using monoclonal antibodies in August, September, and October of 1979. At the least, argues Hybritech, the invention was conceived in January of 1979, long before Drs. Ruoslahti, Engvall, and Uotila began work on a sandwich assay using monoclonal antibodies, and diligence was thereafter exercised until constructive reduction to practice occurred by the filing of the '110 patent application on August 4, 1980.

Dr. David and Greene testified that pages 2118 to 2122 of Dr. David's notebook, dated January 4, 1979, and witnessed January 30, 1979, disclose the generic conception of the invention in the context of the physical support structure used to carry out a sandwich assay, and Dr. David testified on redirect that (1) Page 1128 of notebook 21, dated May 27, 1979, recorded an early attempt at a sandwich assay that failed, (2) on August 3, 1979, as recorded at page 1166, a sandwich assay using monoclonal antibody 068 attached to a solid carrier, a radio-labelled 068 antibody, and a hepatitis antigen from an Abbott Labs polyclonal competitive assay kit was successfully performed, and (3) a sandwich assay using a bound 259 antibody, a radio-labelled 068 antibody, and a hepatitis antigen was successfully performed on September 21, 1979. Hybritech also urges that work in October 1979 directed to determining whether certain monoclonal

antibodies were recognizing the same or different determinants, was a reduction to practice.

Monoclonal points out that these notebook pages do not expressly state that monoclonal antibodies of 10 8liters/mole affinity were used in a sandwich assay and that the May, August, and September notebook entries were not witnessed until about the time Dr. Adams, experienced in patent matters, joined Hybritech and advised its researchers on properly recording laboratory work. They therefore claim that actual reduction to practice was not shown before May 1980.

OPINION

I. Review Under Rule 52(a) Fed.R. Civ. P.

Rule 52(a) "ensures care in the preparation of an opinion . . . and provides appellate courts with the benefit of the District Court's insights into a case," *Pentec, Inc. v. Graphic Controls Corp.*, 776 F.2d 309 318, 227 USPQ 766, 772 (Fed. Cir. 1985) (Harvey, Senior District Judge, concurring) by requiring a district court to "find the facts specially and state separately its conclusions of law thereon." With the exception of the first eight paragraphs, the first half of the district court's opinion here is Monoclonal's *pretrial* brief and the last three pages of the opinion are Monoclonal's *pretrial* findings of fact and conclusions of law. The district court adopted the above documents virtually verbatim, with the exception of portions of each concerning inequitable conduct and noninfringement, apparently without inviting a response from Hybritech, resulting in a repetitious (as the district court admitted in the opinion), sometimes internally inconsistent, and hard to follow opinion that presents us with a difficult task in gleaning the basis for many of the conclusions. For some of the findings, submitted before trial, no supporting evidence was introduced at trial.

The Supreme Court, in *Anderson v. City of Bessemer City, N.C.*, 105 S.Ct. 1504 (1985), strongly criticized the practice of "verbatim adoption of findings of fact prepared by prevailing parties, particularly when those findings have taken the form of conclusory statements unsupported by citation to the record." *Anderson*, *supra* at 1511. This court also has cautioned against the adoption of findings, especially when proposed by a party before trial, as here, and stated that the likelihood of clear error in those findings increases in such a situation. *Lindemann Maschinenfabrik v. American Hoist and Derrick*, 730 F.2d 1452, 1457, 221 USPQ 481, 485 (Fed. Cir. 1984).

Page 87

Notwithstanding our misgivings about whether the findings in this case, prepared before any evidence was introduced, satisfy the objectives of Rule 52(a) -- a carefully prepared opinion providing the reviewing court with the benefit of the district court's *reasoned insights* into the case -- those findings are the district court's and may be reversed only if clearly erroneous. *See Anderson*, *supra*, at 1511; *Lindemann*, 730 F.2d at 1457, 221 USPQ at 485.

"A finding is clearly erroneous when, although there is evidence to support it, the reviewing court on the entire evidence is left with the definite and firm conviction that a mistake has been committed." *United States v. United States Gypsum Co.*, 333 U.S. 364, 395 (1948). "This standard plainly does not entitle a reviewing court to reverse the finding of the trier of fact simply because it is convinced that it would have decided the

case differently." *Anderson*, supra, at 1511. In other words, "if the district court's account of the evidence is plausible in light of the record viewed in its entirety" or "where there are two permissible views of the evidence," the factfinder cannot be clearly erroneous. *Anderson*, supra, at 1511 (quoting *United States v. Yellow Cab Co.*, 338 U.S. 338, 342 (1949)). This is so, stated the Court in dictum, see *Anderson*, supra, at 1516 (Blackmun, J., concurring), even when the district court's findings rest on physical or documentary evidence or inferences from other facts and not on credibility determinations. See also Rule 52(a) Fed.R. Civ. P. (as amended Aug. 1, 1985). If the latter are involved, "Rule 52 demands even greater deference to the trial court's findings" but a trial judge may not "insulate his findings from review by denominating them credibility determinations"; if documents or objective evidence contradict the witness' story, clear error may be found even in a finding purportedly based on a credibility determination. *Anderson*, supra, at 1512-13. We proceed in light of all these principles.

II. Presumption of Validity

Under 35 USC 282, a patent is presumed valid, and the one attacking validity has the burden of proving invalidity by clear and convincing evidence. See, e.g., *American Hoist & Derrick Co. v. Sowa & Sons, Inc.*, 725 F.2d 1350, 1360, 220 USPQ 763, 770 (Fed. Cir. 1984). Notwithstanding that the introduction of prior art not before the examiner may facilitate the challenger's meeting the burden of proof on invalidity, the presumption remains intact and on the challenger throughout the litigation, and the clear and convincing standard does not change. See, e.g., *Jervis B. Webb Co. v. Southern Systems, Inc.*, 742 F.2d 1388, 1392 & n.4, 222 USPQ 943, 945 & n.4 (Fed. Cir. 1984). The only indication that the district court recognized the presumption of validity and its proper application was its statement that "[t]he key issue in this case is whether the defendant has overcome the presumption of nonobviousness." That statement, however, speaks only part of the truth; the presumption of validity goes to validity of the patent in relation to the patent statute as a whole, not just to nonobviousness under Section 103.

III. Prior Invention of Another, 35 USC 102(g)

Section 102(g) states that a person shall be entitled to a patent unless "before the applicant's invention thereof the invention was made in this country by another who had not abandoned, suppressed, or concealed it." Section 102(g) "relates to prior inventorship by another in this country" and "retains the rules governing the determination of priority of invention" *Kimberly-Clark Corp. v. Johnson & Johnson*, 745 F.2d 1437, 1444, 223 USPQ 603, 606 (Fed. Cir. 1984) (quoting P.J. Federico, *Commentary on the New Patent Act*, 35 USCA page 1, at 19 (1954)). Section 102(g) says: "In determining priority of invention there shall be considered not only the respective dates of conception and reduction to practice of the invention, but also the reasonable diligence of one who was first to conceive and last to reduce to practice, from a time prior to conception by the other."

Reduction to practice, and conception as well, is a legal determination subject to review free of the clearly erroneous standard. *Barmag Barmer Maschinenfabrik AG v. Murata Machinery, Ltd.*, 731 F.2d 831, 837, 221 USPQ 561, 565-66 (Fed. Cir. 1984); *D.L. Auld Co. v. Chroma Graphics Corp.*, 714 F.2d 1144, 1151, 219 USPQ 13, 18 (Fed. Cir. 1983). Findings of fact supporting that legal conclusion, are, of course, reviewed under the clearly erroneous standard.

Conception is the "formation in the mind of the inventor, of a definite and permanent

idea of the complete and operative invention, as it is hereafter to be applied in practice." 1 *Robinson On Patents* 532 (1890); *Coleman v. Dines*, 754 F.2d 353, 359, 224 USPQ 857, 862 (Fed. Cir. 1985). Actual reduction to practice requires that the claimed invention work for its intended purpose, *see, e.g., Great Northern Corp. v. Davis Core & Pad Co.*, 782 F.2d 159, 165, 228 USPQ 356, 358, (Fed. Cir. 1986), and, as has long been the law, constructive reduction to practice occurs when a patent application on the claimed invention is filed. *Weil v. Fritz*, 572 F.2d 856, 865 n.16,

Page 88

196 USPQ 600, 608 n.16 (CCPA 1978) (citing with approval *Automatic Weighing Machine Co. v. Pneumatic Scale Corp.*, 166 F. 288 (1st Cir. 1909)).

[1] After a review of the record in its entirety, including the numerous corroborating Hybritech laboratory notebooks, internal documents, and pertinent testimony, we hold clearly erroneous the district court's finding that there is no clear or corroborated evidence "with regard to when before May 1980, the idea of actually using monoclonals in sandwich assays" was conceived or, more properly, of when the *claimed invention* was conceived, and therefore reverse the court's holding, as a matter of law, that Hybritech's inventors did not conceive the claimed invention before May 1980.

Hybritech's claim of conception, generally, is evidenced by the sometimes sparsely documented work of a start-up company whose first small advances evolved into the myriad activities of a mature company with efforts directed toward developing the claimed invention by first employing the Kohler and Milstein technology to produce the necessary monoclonal antibodies and using those antibodies in diagnostic sandwich assay kits. There is no doubt that exploiting monoclonal antibodies for use in sandwich assays was one of the major objectives of Hybritech. In a letter to Pharmacia Fine Chemicals dated April 26, 1979, Greene, in responding to Pharmacia's interest in Hybritech's products, outlined the latter's "efforts to bring the exciting new hybridoma technology into routine medical use" and its exploration of "several intriguing concepts for which monoclonals may open up new immunodiagnostic techniques heretofore infeasible with animal serums." Although company minutes in early 1979 contain little about the claimed subject matter and some of the discussions thereon, such as Greene's and Dr. Adams' conversation about monoclonal sandwich assays when the former was trying to woo Dr. Adams to join Hybritech were unrecorded, the Hybritech laboratory notebooks and the nature of Hybritech's research program fully corroborate the testimonial evidence of conception and thus clearly support our holding that Hybritech conceived the claimed invention before LJCRF.

Dr. David's January 1979 notebook describes, in detail, as explained by Greene and Dr. David at trial, a nylon apparatus that undoubtedly could be used for performing a sandwich assay using monoclonal antibodies, although Dr. David testified on cross-examination that at that time Hybritech had not yet developed any monoclonal antibodies, including attaching one of the reagents to a solid carrier ring, contacting that ring with a fluid sample in a microtiter plate well, adding a labelled reagent to the well after rinsing, and then "counting" or measuring the amount of either the labelled or unlabelled reagent after a prescribed time and second rinsing. The notebook then describes the procedure for detecting an antibody "(a-x)" to an antigen "(x)" complete with diagrams and text, both illuminated by Dr. David at trial. The notebook further

states, "Alternatively, if one wished to quantitate an antigen, y, the identical procedure would be followed, except that reagents would be reversed, i.e. the reaction would be:" and there follows a clear illustration of an antibody attached to a solid carrier reacting with an antigen to form a complex, and that complex reacting with a second labelled antibody. The notebook was signed by Dr. David on January 4, 1979, and witnessed and signed on January 30 of the same year by Dr. Curry, the first cell biologist hired at Hybritech to set up the hybridoma production program.

Dr. David testified on direct that monoclonal antibodies were developed in the following months: antigens were purchased from outside sources and purified before being injected into mice; the spleen cells from those mice were fused with myelomas; and the resultant hybridomas were separated into well plates for development, and a radioimmunoassay procedure was carried out to determine the affinity of the antibodies.

The May 1979 failed sandwich assay, witnessed in May 1980, corroborates Dr. David's testimony that a polyclonal antibody bound to a solid carrier and a labelled monoclonal antibody were used in a sandwich assay with an antigen from Abbott Labs' Ausria polyclonal diagnostic kit for hepatitis. No binding was detected.

Dr. David testified about the experiment documented in the August 1979 notebook, a sandwich assay with a hepatitis antigen from an Abbott Labs Ausria kit with two Hybritech 068 monoclonal antibodies, one attached to a solid carrier bead and the other labelled; the purpose of the experiment was to quantitate the antigen. The notebook corroborates Dr. David's testimony that the test was positive and lists the counts per minute of the labelled antibody. Defendant Monoclonal's expert Ciotti testified about this experiment:

Also, of course, it is limited to -- it is limited to hepatitis antigen. And without a generic conception, it would just be merely a -- if it did work for its intended purpose -- which I would assume for purposes of discussion -- *it would be a reduction to practice of one embodiment*. And without a corresponding generic conception, I don't think it would be held to be the making of the invention in

Page 89

terms of, for instance, in claim 19. [Emphasis ours.]

Dr. David further testified that the September 21, 1979, record in David's notebook, witnessed months later, shows a reverse sandwich assay using a bound 259 monoclonal antibody and a labelled 068 monoclonal antibody with a hepatitis antigen with results confirmed by a dose response curve. ² Hybritech further alleges that a laboratory notebook page dated October 1979 is a reduction to practice of the claimed invention but fails to cite any related testimony or other evidence in support thereof.

Finally, the record shows that the claimed affinity limitation "of at least about 10 gliters/mole" was determined and appreciated during the course of the development of the claimed subject matter. Dr. David and Dr. Adams separately testified that the screening procedures used by Hybritech ensured that only monoclonal antibodies having at least 10 gliters/mole affinity would be used in assays. An October 1979 internal memorandum from Greene to the staff states "To improve comparisons we will express all affinities to the base ten to the eighth which represents the lower end of the useable range."

We are left with the definite and firm conviction that a mistake has been committed because the district court's account of the evidence that "there was no credible evidence

of conception before May 1980" is insupportable. There is such evidence. The laboratory notebooks, alone, are enough to show clear error in the findings that underlie the holding that the invention was not conceived before May 1980. That some of the notebooks were not witnessed until a few months to one year after their writing does not make them incredible or necessarily of little corroborative value. Admittedly, Hybritech was a young, growing company in 1979 that failed to have witnesses sign the inventors' notebooks contemporaneously with their writing. Under a reasoned analysis and evaluation of all pertinent evidence, however, we cannot ignore that Hybritech, within a reasonable time thereafter, prudently had researchers other than those who performed the particular experiments witness the notebooks in response to Tom Adams' advice. The notebooks clearly show facts underlying and contemporaneous with conception of the claimed invention and in conjunction with the testimony of Dr. David and Greene, and others, are altogether legally adequate documentary evidence, under the law pertaining to conception, of the formation in the minds of the inventors of a definite and permanent idea of the complete and operative invention as it was thereafter applied in practice. We thus are not moved by Monoclonal's argument that the findings of fact underlying conception are based on credibility determinations and are more sacrosanct than usual. *See Anderson, supra*, at 1512-13.

1. LJCRF Is Not Prior Art

Hybritech laboratory notebooks and the uncontradicted testimony of Dr. David and Mr. Greene show that development of the claimed invention proceeded diligently through the rest of 1979 and 1980, there being absolutely no evidence of record nor even argument by Monoclonal that Hybritech was not diligent in its efforts to reduce to practice the claimed invention during the period January 1979 to the '110 application filing date of August 4, 1980. We therefore hold as a matter of law that Hybritech's conception, which was before LJCRF conceived the claimed invention, coupled by diligence to its constructive reduction to practice by the filing of the '110 application, entitle Hybritech to priority over LJCRF. *See* 35 USC 102(g). The work of LJCRF is therefore not prior art.

We also note that there is inadequate factual basis for the district court's holding that LJCRF reduced the claimed invention to practice as early as November 1979 because the only evidence that corroborates the testimony of Ruoslahti, Uotila, and Engvall is the note from Ruoslahti to Uotila, *see* section A, 2, *supra*, which indisputably is not the claimed invention, and the *one* curve from *one* graph from only one page, 43D, of the six Uotila notebooks. After a reasoned examination, analysis, and evaluation of this pertinent evidence we conclude that it falls far short of showing the "formation in the mind of the inventor, of a definite and permanent idea of the complete and operative invention, as it is hereafter to be applied in practice," *see Coleman*, 754 F.2d at 359, 224 USPQ at 862, and therefore is legally inadequate to support even a holding of *conception* of the claimed invention by LJCRF personnel in 1979.

(1) It is undisputed that page 43D was not signed, witnessed, or dated; (2) the deposition testimony of Uotila was that she could not remember the procedure used to arrive at the dose-response curve on page 43D and there was not enough information in her notebook to refresh her memory; (3) the testimony of

Ruoslahti was that he could find *no* data in the notebook supporting that graph, none of the *later* graphs shown there represented successful assays and that "especially after this was done, we ran into more severe problems. And it took us a while to do away with the problems;" (4) Ruoslahti also testified that they never determined, in 1979, the affinities of the monoclonal antibodies they used, and that the title of page 43D had been altered at some point -- the word "inhibition" had been crossed out and "sandwich" written in; and (5) the testimony of Engvall was that there was nothing about the shape of those curves which indicates that they were sandwich assays. We also note, as evidence bearing upon the credibility of Ruoslahti's testimony (that LJCRF actually reduced the claimed invention to practice in 1979), that when LJCRF attempted to provoke an interference in the PTO with Hybritech based on the U.S. filing of an application that was the counterpart to a Swedish application disclosing similar subject matter, LJCRF could not demonstrate even a *prima facie* reduction to practice prior to Hybritech's August 4, 1980, filing date. During that proceeding, the earliest dates Ruoslahti set down on paper to support conception and reduction to practice were in 1980.

2. The Work of Oi/Herzenberg Is Not the Claimed Invention

[2] It is axiomatic that for prior art to anticipate under §102 it has to meet every element of the claimed invention, and that such a determination is one of fact. *See, e.g., Lindemann, supra*, 730 F.2d at 1458, 221 USPQ at 485; *Great Northern Corp. v. Davis Core & Pad Co.*, 782 F.2d 159, 165, 228 USPQ 356, 358 (Fed. Cir. 1986). Section 102(g) upon which the district court relied is one type of "anticipation," i.e., prior invention by another of the same invention. Drs. Oi and Herzenberg testified that their work did not involve detecting the presence of or quantitating antigen but a determination of the number and location of epitopes on a *known* quantity of antigen. Although this work did involve a sandwich assay to the extent that an antigen was sandwiched between two monoclonal antibodies, it is clear that the similarity between that work and the claimed invention goes no further. Furthermore, both doctors testified that they did not know the affinities of the antibodies that were used in their mapping work and in fact never calculated them. Ciotti, Monoclonal's expert, testified that the 10⁸ affinity limitation cannot be found anywhere in the Oi/Herzenberg work. Again we are left with a definite and firm conviction that a mistake was made because that work does not meet every element of the claimed invention. The district court's finding to the contrary is clearly erroneous.

We note that the district court, in also holding the patent invalid under §103, next considered, combined the Oi/Herzenberg work with the Frankel reference, one justifiable inference therefrom being that the court recognized that Frankel discloses a claim *element* that Oi/Herzenberg does not, namely, at least about 10⁸ liters/mole affinity.

IV. Obviousness, 35 USC 103

A section 103 obviousness determination -- whether the claimed invention *would have been* (not "would be" as the court repeatedly stated because Monoclonal's pretrial papers used that improper language) obvious at the time the invention was made is reviewed free of the clearly erroneous standard although the underlying factual inquiries -- scope and content of the prior art, level of ordinary skill in the art,³ and differences between the prior art and the claimed invention -- integral parts of the subjective determination involved in §103, are reviewed under that standard. Objective evidence such as commercial success, failure of others, long-felt need, and unexpected results must

be considered *before* a conclusion on obviousness is reached and is not merely "icing on the cake," as the district court stated at trial. See *Lindemann*, supra, 730 F.2d at 1461, 221 USPQ at 488; *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983); *Kansas Jack, Inc. v. Kuhn*, 719 F.2d 1144, 219 USPQ 857 (Fed. Cir. 1983); *W.L. Gore & Associates v. Garlock Inc.*, 721 F.2d 1540, 220 USPQ 303, 314 (Fed. Cir. 1983).

1. The Eight Articles "Predicting" Widespread Use of Monoclonal Antibodies

Before discussing the more pertinent references in this case -- the Oi/Herzenberg and Frankel works -- we cull the other prior art references relied on by the trial court.

[3] First, the latest four of the eight articles that the court stated were of the "utmost importance" because they "predicted" that the breakthrough in production of monoclonal antibodies by Kohler and Milstein would lead to widespread use of monoclonal antibodies in

Page 91

immunoassays are neither 102(a)/103 nor 102(b)/103 prior art because they are dated between late 1979 and March 6, 1980, well after the date of conception and within one year of the filing date of the '110 patent.

The earliest four of the eight articles, on the other hand, although clearly prior art, discuss *production* of monoclonal antibodies -- admittedly old after Kohler and Milstein showed how to produce them -- but none discloses sandwich assays. At *most*, these articles are invitations to try monoclonal antibodies in immunoassays but do not suggest how that end might be accomplished. To the extent the district court relied upon these references to establish that it would have been *obvious to try* monoclonal antibodies of 10⁸ liters/mole affinity in a sandwich immunoassay that detects the presence of or quantitates antigen, the court was in error. See *Jones v. Hardy*, 727 F.2d 1524, 1530, 220 USPQ 1021, 1026 (Fed. Cir. 1984) ("Obvious to try" is improper consideration in adjudicating obviousness issue).⁴

2. The Kohler and Milstein Work, the Cuello Article and the Jeong, Piasio, and Schurr Patents Considered by the Examiner

The district court's finding that Kohler and Milstein developed a method for producing monoclonal antibodies in vitro is correct, but that finding proves no more; although it made possible all later work in that it paved the way for a supply of monoclonal antibodies, it indisputably does not suggest using monoclonal antibodies in a sandwich assay in accordance with the invention claimed in the '110 patent.

The Cuello reference discloses monoclonal antibodies but not in a sandwich assay. The competitive assay in Cuello, moreover, uses only one monoclonal antibody and thus in no way suggests the claimed invention wherein a ternary complex of two monoclonal antibodies and an antigen form a sandwich. Furthermore, the court did not explain how this art, by itself or in combination with any of the other art, suggests the claimed subject matter and thus why that combination would have been obvious. We are of the opinion that it does not.

The district court correctly found that the use of polyclonal antibodies in sandwich assays was well known. The Jeong patent discloses the use of polyclonal antibodies in a

simultaneous sandwich assay, with no suggestion that monoclonal antibodies be so used. It is prior art by virtue of §102(e), application for the patent having been filed September 5, 1978, its effective date as a reference. The Piasio patent, disclosing a reverse sandwich assay using polyclonal antibodies, and Schurrs, disclosing a forward sandwich assay using the same, both §102(a) prior art, are likewise devoid of any suggestion that monoclonal antibodies can be used in a similar fashion.

3. The Oi/Herzenberg Work and the Frankel Article

Clearly, the most pertinent items of prior art not cited by the examiner are the Oi/Herzenberg work, as described in section A, 3, *supra*, and the Frankel article. As stated in the discussion of Prior Invention of Another (section III, 2, *supra*), the Oi/Herzenberg work involved mapping epitopes on a known quantity of antigen. It was not concerned with and does not disclose using monoclonal antibodies of at least 10⁸ liters/mole affinity. Oi and Herzenberg testified that they did not know the affinity of the antibodies used, and Ciotti testified that nowhere in that work is there mention of monoclonal antibody affinity of at least 10⁸ liters/mole. On this basis, we conclude that the Oi/Herzenberg work is qualitatively different than the claimed invention; the former is directed to mapping epitopes on a known quantity of antigen and the latter to determining the "presence or concentration of an antigenic substance in a sample of fluid" We disagree with Monoclonal that these are "essentially the same thing." Furthermore, it is perfectly clear that this work in no way suggests using monoclonal antibodies of the affinity claimed in the '110 patent. It is because of these differences between the Oi/Herzenberg work and the claimed invention that the fact that an antigen was sandwiched between two monoclonal antibodies in the course of Oi's and Herzenberg's work is not sufficient basis to conclude that the claimed invention would have been obvious at the time it was made to a person of ordinary skill in the art.

Likewise, a conclusion that the invention would have been obvious cannot properly be reached when the Oi/Herzenberg work is

Page 92

considered in view of the Frankel article. Frankel teaches a method for rapid determination of affinity constants for monoclonal antibodies, some of which clearly have affinities of the order defined by the claims, but does not in any way suggest using two of those antibodies in a sandwich to assay an antigen by forming a ternary complex of labelled antibody, the antigenic substance, and a bound antibody wherein the presence of the antigenic substance is determined by measuring either the amount of labelled antibody bound to a solid carrier or the amount of unreacted labelled antibody. The mere existence of prior art disclosing how to measure the affinity of high affinity monoclonal antibodies is insufficient to support a holding of obviousness. Hybritech's claims define a *process* that *employs* monoclonal antibodies, and does not merely claim antibodies of high affinity. In view of the fact that the Oi/Herzenberg work is not directed to an assay as claimed and does not disclose antibodies of at least 10⁸ liters/mole affinity, and further that Frankel fails to suggest using such antibodies in a sandwich assay, the Frankel article does not compensate for the substantial difference between the Oi/Herzenberg work and the claimed subject matter, and therefore those references in combination cannot support a holding of obviousness.

4. Objectiv Evidence of Nonobviousness

[4] In one part of its opinion the court found that "the commercial success of the kits *may* well be attributed to the business expertise and acumen of the plaintiff's personnel, together with its capital base and marketing abilities" (emphasis ours) and later that "[w]here commercial success is based on the sudden availability of starting materials, in this instance the availability of monoclonal antibodies as a result of the Kohler and Milstein discovery, business acumen, marketing ability, and capital sources, no causal relationship is proven." (Citation omitted.)

i. Commercial Success: Hybritech's Diagnostic Kits Grabbed a Substantial Market Share

The undisputed evidence is that Hybritech's diagnostic kits had a substantial market impact. The first diagnostic kit sales occurring in mid-1981, sales increased seven million dollars in just over one year, from \$6.9 million in 1983 to an estimated \$14.5 million in 1984; sales in 1980 were nonexistent. Competing with products from industry giants such as Abbott Labs, Hoffman LaRoche, Becton-Dickinson, and Baxter-Travenol, Hybritech's HCG kit became the market leader with roughly twenty-five percent of the market at the expense of market shares of the other companies. Its PAP kit ranks second only to a product sold by Dupont's New England Nuclear, surpassing products from Baxter-Travenol, Abbott, and others. Hybritech's other kits, indisputably embodying the invention claimed in the '110 patent, obtained similar substantial market positions.

Although the district court did not provide its insights into why commercial success was due to business acumen and not to the merits of the claimed invention, Monoclonal urges in support that it was due to Hybritech's spending disproportionate sums on marketing, 25-30% of income. The undisputed evidence was that expenditures of *mature* companies in this field are between 17 and 32%. Furthermore, the record shows that advertising makes those in the industry -- hospitals, doctors, and clinical laboratories -- aware of the diagnostic kits but does not make these potential users buy them; the products have to work, and there is no evidence that that is not the case here or that the success was not due to the merits of the claimed sandwich assays -- clearly contrary to the district court's finding.

The trial court's finding that the "sudden availability of monoclonals" was the reason for the commercial success of Hybritech's diagnostic kits (Finding 11) is unsupported by the record and clearly erroneous. Monoclonal admits that monoclonal antibodies were available in the United States in 1978, and the evidence clearly reflects that. Thus, at least *three years* passed between the time monoclonal antibodies were available in adequate supply and the time Hybritech began selling its kits. Especially in the fast-moving biotechnology field, as the evidence shows, that is anything but sudden availability.

ii. Unexpected Advantages

Hybritech points to the testimony of three witnesses skilled in the diagnostic field who state that, based on tests done in their laboratories as a result of real-world comparisons in the normal course of research, the diagnostic kits that embody the '110 invention unexpectedly solved longstanding problems. Dr. Hussa, the head of a large referral laboratory and a world-wide consultant, testified that until Hybritech introduced its kits, he and others were very skeptical and had almost exclusively used competitive assays with a radioactive tracer (RIAs). ⁵ In relation to an HCG Hybritech

kit, he testified that he had first thought that the Hybritech HCG kit would not give accurate results for low antigen concentrations because that condition is indicated in the Hybritech kit by a low radioactivity reading, a reading difficult to differentiate from control samples containing no antigen. He also stated that in the past, RIA kits falsely detected HCG in nonpregnant women, a condition which would indicate cancer and surgery. He stated that when he employed the Hybritech HCG kit in such instances it demonstrated, correctly and absent any difficulty interpreting the data, that no HCG was present.

Dr. Blethen, an M.D. holding a Ph.D. in biochemistry, testified that she did not think that the Hybritech HGH kit, for detecting growth hormone in children, would offer any advantage, but she determined that it detected HGH deficiencies in children where conventional RIAs failed to do so. She also stated that the kit does not give false positive readings as do conventional RIA kits, an opinion shared by Dr. Husa. A third witness, Dr. Herschman, who holds a master's degree in chemistry, testified that he spent years working on the development of an assay that would determine the presence of TSH (thyroid stimulating hormone) with greater sensitivity. He succeeded but discovered that the Hybritech TSH kit had the same sensitivity, the test being performed in four hours rather than the three days his kit required.

Having considered the evidence of nonobviousness required by §103 and *Graham*, supra, we hold, as a matter of law, that the claimed subject matter of the '110 patent would not have been obvious to one of ordinary skill in the art at the time the invention was made and therefore reverse the court's judgment to the contrary. The large number of references, as a whole, relied upon by the district court to show obviousness, about twenty in number, skirt all around but do not as a whole suggest the claimed invention, which they must, to overcome the presumed validity, *Lindemann*, 730 F.2d at 1462, 221 USPQ at 488, *as a whole*. See 35 USC 103; *Jones v. Hardy*, 727 F.2d 1524, 1529, 220 USPQ 1021, 1024 (Fed. Cir. 1984). Focusing on the obviousness of substitutions and differences instead of on the invention as a whole, as the district court did in frequently describing the claimed invention as the mere substitution of monoclonal for polyclonal antibodies in a sandwich assay, was a legally improper way to simplify the difficult determination of obviousness. See generally *Hodosh v. Block Drug Co.*, 786 F.2d 1136, 229 USPQ 182 (Fed. Cir. 1986).⁶

With respect to the objective indicia of nonobviousness, while there is evidence that marketing and financing played a role in the success of Hybritech's kits, as they do with any product, it is clear to us on the entire record that the commercial success here was due to the merits of the claimed invention. It cannot be argued on this record that Hybritech's success would have been as great and as prolonged as admittedly it has been if that success were not due to the merits of the invention. The evidence is that these kits compete successfully with numerous others for the trust of persons who have to make fast, accurate, and safe diagnoses. This is not the kind of merchandise that can be sold by advertising hyperbole.

V. Enablement, Best Mode, and Definiteness Under §112

The section 112 defense appears to have been an afterthought of both Monoclonal, who briefly but unsuccessfully attempts to defend this utterly baseless determination, and

of the district court which adopted the defense from Monoclonal's pretrial papers apparently without knowledge of the applicable law, to highlight, as it stated at trial, that it was part of its job to see that "whoever wins wins all the way or whoever loses loses all the way." Taken as a whole, the court's comments on §112 -- split into two parts, one from Monoclonal's pretrial brief and the other from the adopted pretrial

Page 94

findings and conclusions -- are internally inconsistent. The opinion states that the patent fails to disclose how (1) to make monoclonal antibodies; (2) to screen for proper monoclonal antibodies; and (3) to measure monoclonal antibody affinity and therefore the specification is nonenabling and does not satisfy the best mode requirement, and the claims are indefinite. We discuss each of these in turn.

1. Enablement

Enablement is a legal determination of whether a patent enables one skilled in the art to make and use the claimed invention, *Raytheon Co. v. Roper Corp.*, 724 F.2d 951, 960, 220 USPQ 592, 599 (Fed. Cir. 1983), is not precluded even if some experimentation is necessary, although the amount of experimentation needed must not be unduly extensive, *Atlas Powder Co. v. E.I. Du Pont De Nemours & Co.*, 750 F.2d 1569, 1576, 224 USPQ 409, 413 (Fed. Cir. 1984), and is determined as of the filing date of the patent application, which was August 4, 1980. See *W.L. Gore and Associates v. Garlock, Inc.*, 721 F.2d 1540, 1556, 220 USPQ 303, 315 (Fed. Cir. 1983). Furthermore, a patent need not teach, and preferably omits, what is well known in the art. *Lindemann*, 730 F.2d at 1463, 221 USPQ at 489.

The record fully supports the '110 patent's statement that

The monoclonal antibodies used for the present invention are obtained by the [hybridoma] process discussed by Milstein and Kohler. . . . The details of this process are well known and not repeated here.

The district court itself stated that the "method for producing monoclonal antibodies in vitro was well known prior to the alleged invention of the '110 patent," and used the "sudden availability of monoclonal antibodies" produced by the Kohler and Milstein discovery to support, albeit erroneously, its finding of a lack of nexus between the merits of the claimed invention and its commercial success. The court then about-faced and held the '110 patent deficient because it fails to teach how to make monoclonal antibodies.

With respect to screening, the only permissible view of the evidence is that screening methods used to identify the necessary characteristics, including affinity, of the monoclonal antibodies used in the invention were known in the art and that the '110 patent contemplated one of those. At trial, Monoclonal's counsel stated "it is a procedure that was known in '78." In similar fashion, the district court held that the claimed subject matter would have been obvious in part because the "existence of monoclonal antibodies *having the affinity constants claimed in the patent was well known* prior to the alleged invention" [Emphasis ours.] Furthermore, there was not a shred of evidence that undue experimentation was required by those skilled in the art to practice the invention. We hold as a matter of law that the '110 patent disclosure is enabling.

2. Best Mode

"The specification . . . shall set forth the best mode contemplated by the inventor of carrying out his invention." 35 USC 112. Because not complying with the best mode requirement amounts to concealing the preferred mode contemplated by the applicant at the time of filing, in order to find that the best mode requirement is not satisfied, it must be shown that the applicant knew of and concealed a better mode than he disclosed. *DeGeorge v. Bernier*, 768 F.2d 1318, 1324, 226 USPQ 758, 763 (Fed. Cir. 1985) (quoting with approval *In re Sherwood*, 613 F.2d 809, 204 USPQ 537 (CCPA 1980)). The only evidence even colorably relating to concealment is testimony by various Hybritech employees that sophisticated, competent people perform the screening and that the screening process is labor-intensive and time-consuming. It is not plausible that this evidence amounts to proof of concealment of a best mode for screening or producing monoclonal antibodies for use in the claimed '110 process, and therefore we are of the firm conviction that the district court's finding that the best mode requirement was not satisfied is clearly erroneous.

3. Indefiniteness

[5] The basis of the district court's holding that the claims are indefinite is that "they do not disclose how infringement may be avoided because antibody affinity cannot be estimated with any consistency." (Conclusion 6.) Even if the district court's finding in support of this holding -- that "there is no standard set of experimental conditions which are used to estimate affinities" -- is accurate, under the law pertaining to indefiniteness -- "if the claims, read in light of the specification, reasonably apprise those skilled in the art both of the utilization and scope of the invention, and if the language is as precise as the subject matter permits, the courts can demand no more," *Shatterproof Glass Corp. v. Libbey Owens Ford Co.*, 758 F.2d 613, 624, 225 USPQ 634, 641 (Fed. Cir. 1985) -- the claims clearly are definite. The evidence of record indisputably shows that calculating affinity was known in the art at the time of filing, and

Page 95

notwithstanding the fact that those calculations are not precise, or "standard," the claims, read in light of the specification, reasonably apprise those skilled in the art and are as precise as the subject matter permits. As a matter of law, no court can demand more.

VI. Motions

Monoclonal's motion to strike Appendices A and B of Hybritech's reply brief as being beyond the page limit applicable to reply briefs is granted as to Appendix A but denied as to Appendix B, the latter having been helpful in culling the often non-supportive citations to the record by Monoclonal.

Hybritech's motion to supplement the record with a Monoclonal advertisement not considered at trial is denied. Any adverse impact that the disposition of these two motions has upon either party is more than outweighed by this court's patience with the seemingly endless flow of post-argument argumentative papers.

VII. Conclusion

The judgment of the district court holding the patent in suit invalid is *reversed* in all respects, and the case is *remanded* for a determination of the issue of infringement which the court held was moot.

REVERSED AND REMANDED

Footnotes

Footnote 1. With respect to obviousness, one portion of the district court's opinion apparently relies on all of the above listed references, (1)-(5), for the obviousness holding while a later portion entitled "CONCLUSIONS OF LAW" relies on only the Oi/Herzenberg and Frankel articles. Furthermore, the district court did not state that the LJCRF work was considered for purposes of §103, although we recognize that §102(g) prior art can be used for §103.

Footnote 2. A dose response curve is antigen concentration plotted against the signal produced by labelled antibody in an immunoassay. The signal increases with increasing antigen concentration in a successful assay but at some point decreases when the antigen concentration becomes too high.

Footnote 3. Although the district court failed expressly to find the level of ordinary skill in the art at the time the invention was made, it did make reference to "[p]eople working in immunology aware of the Kohler and Milstein discovery" which we deem an accurate finding for the purposes of that portion of the *Graham* factual inquiries.

Footnote 4. Finding 10, which states that the invention was contemporaneously developed and disclosed in at least five publications and patent applications not listed above *and dated well after the filing date of the '110 patent but before its issuance* is irrelevant for purposes of the hypothesis based on the three factual inquiries required by §103 as interpreted by *Graham v. John Deere*, 383 U.S. 1, 148 USPQ 459 (1966) because obviousness must be determined as of the time the invention was made. Additionally, they are of little probative value in this case because they are dated December 1981 at the earliest, more than a year after the August 4, 1980, filing date here and roughly two years after conception occurred. Furthermore, simultaneous development may or may not be indicative of obviousness, the latter being the case here for the above reasons and because the other evidence of nonobviousness is adequate, such occurrences having been provided for in 35 USC 135. *Lindemann*, supra, 730 F.2d at 1460-61, 221 USPQ at 487; *Environmental Designs, Ltd. v. Union Oil Co. of California*, 713 F.2d 693, 698 n.7, 218 USPQ 865, 869 n.7 (Fed. Cir. 1983)

Footnote 5. Monoclonal's expert Blakemore testified that of 425 assays on the market in 1979 less than 1% were sandwich assays. Today, sandwich assays constitute the majority of all assays sold.

The record also shows that Blakemore, who testified extensively for Monoclonal that the claimed invention would have been obvious, never used monoclonal antibodies in sandwich assays at Cetus before 1980. Additionally, she did not even mention them in the Jeong patent, of which she was a coinventor, which issued January 13, 1981, long after the beginning of Hybritech's work in this area in 1979.

Footnote 6. It bears repeating that it is crucial that counsel set forth the law accurately. More particularly, it is the duty of counsel to impart to the judge that the obviousness question properly is whether the *claimed invention as a whole would have been* obvious to one of *ordinary skill in the art at the time the invention was made*, and that the district court must *expressly* make the three factual determinations required by *Graham* and consider objective evidence of obviousness *before* the legal conclusion of obviousness vel non is made. Submitting to the court language like "any differences . . . would have

been obvious," as was done here, violates the axiom that the question is not whether the differences would have been obvious but the claimed invention *as a whole*. Furthermore, arguing that "it would be obvious" rather than that it would *have been* obvious shifts the court's focus to the wrong period of time, namely to a time long after the invention was made, in which, more likely than not, the prior art and the level of ordinary skill in the art are more advanced. *See* 35 USC 103.

- End of Case -

In re HOEKSEMA

(CCPA)

158 USPQ 596

Decided Aug. 8, 1968

No. 7778

U.S. Court of Customs and Patent Appeals

Headnotes

PATENTS

1. Rehearing and reopening—In general (§ 57.1)

Court of Customs and Patent Appeals grants rehearing because of continuing importance of questions involved and strong suggestion of error in its earlier opinion.—
In re Hoeksema (CCPA) 158 USPQ 596.

2. Patentability—Composition of matter (§ 51.30)

Process obviousness is relevant in deciding compound obviousness.—In re
Hoeksema (CCPA) 158 USPQ 596.

3. Patentability—Invention—In general (§ 51.501)

In context of 35 U.S.C. 103, court is not permitted to fragment a claimed invention in applying that section; invention must be considered as a whole.—In re Hoeksema (CCPA) 158 USPQ 596.

4. Patentability — Composition of matter (§ 51.30)

Claimed compound is the invention as a whole (35 U.S.C. 103), but, so considered, unless there is some known or obvious way to make compound, invention is nothing more than a mental concept expressed in chemical terms and formulae on a paper; invention as a whole is claimed compound and a way to produce it; since there is no showing that claimed compound can exist because there is no showing of a known or obvious way to manufacture it, the invention as a whole is not obvious under section 103.—In re Hoeksema (CCPA) 158 USPQ 596.

5. Patentability — Anticipation — In general (§ 51.201)**Patentability — Invention—In general (§ 51.501)**

Conditions for patentability, novelty and loss of right to patent, stated in 35 U.S.C. 102, may have relevance as to disclosure which must be found in prior art to find obviousness of invention under section 103; in determining that quantum of prior art disclosure which is necessary to declare applicant's invention "not novel" or "anticipated" within section 102, test is whether reference contains an enabling disclosure; this test applies to issues under section 103.—In re Hoeksema (CCPA) 158 USPQ 596.

6. Patentability—Composition of matter (§ 51.30)

If prior art fails to disclose or render obvious a method for making claimed compound, at time invention was made, it may not be legally concluded that compound itself is in possession of public; absence of known or obvious process for making claimed compounds overcomes presumption that compounds are obvious, based on close relationships between their structures and those of prior art compounds.—In re Hoeksema (CCPA) 158 USPQ 596.

7. Pleading and practice in Patent Office—Rejections (§ 54.7)

Patent Office having cited reference which rendered claimed compounds prima facie obvious, applicant sustained burden of going forward with contrary evidence by filing affidavit pointing out that reference does not disclose process for producing claimed compounds, thus overcoming Office's position as to reference's legal effect under 35 U.S.C. 103; thereupon, burden of going forward with proofs to support its position as to obviousness shifted to Office; Office's failure to produce such evidence requires that rejection be reversed.—In re Hoeksema (CCPA) 158 USPQ 596.

Particular patents — 9-D-Psicofuranosylpurine

Hoeksema, 9-D-Psicofuranosylpurine and 6-Substituted Derivatives, claim 1 of application allowed.—In re Hoeksema (CCPA) 158 USPQ 596.

Case History and Disposition:

Page 597

Appeal from Board of Appeals of the Patent Office.

Application for patent of Herman Hoeksema, Serial No. 30,770, filed May 23, 1960; Patent Office Group 120. From decision rejecting claim 1, applicant appeals. Affirmed at 154 USPQ 169. On petition for rehearing. Reversed; Kirkpatrick, Judge, dissenting with opinion.

Attorneys:

EARL C. SPAETH (EUGENE O. RETTER and GEORGE T. JOHANNESSEN of counsel) all of Kalamazoo, Mich., for appellant.

JOSEPH SCHIMMEL (JACK E. ARMORE of counsel) for Commissioner of Patents.

Judge:

Before WORLEY, Chief Judge, RICH, SMITH, and ALMOND, Associate Judges, and KIRKPATRICK, Judge. *

Opinion Text**Opinion By:**

SMITH, Judge.

[1] In our prior consideration of this appeal, we affirmed the decision of the Patent Office Board of Appeals, which had affirmed the examiner's rejection of the sole remaining claim of appellant's application, ¹In re Hoeksema, 54 CCPA 1618, 379 F.2d 1007, 154 USPQ 169 (1967). Because of the continuing importance of the questions involved, and the strong suggestion of error in our earlier opinion, we granted appellant's petition for a rehearing under the provisions of Rule 7 of this court, 55 CCPA—, (October 5, 1967).

The parties filed new briefs, and the case was reargued on January 3, 1968. Upon reconsideration of our previous decision, we have concluded that our previous decision was erroneous and that a proper resolution of the issues requires that we *reverse* the decision of the board.

The facts are set forth in our original opinion. We shall assume familiarity with that statement of facts and shall here redevelop only those which we now believe were previously misapprehended or misapplied and require the present decision.

The sole claim on appeal is directed to a chemical compound and reads as follows:

1. An N-psicofuranoside having the formula:

Page 598

Graphic material consisting of a chemical formula or diagram set at this point is not available. See text in hard copy or call BNA PLUS at 1-800-452-7773 or 202-452-4323.

wherein A is selected from the class consisting of hydrogen, the group -XR wherein R is selected from the class consisting of hydrogen, lower-alkyl, and lower-aralkyl, and X is selected from the class consisting of oxygen and sulfur,

and the group

Graphic material consisting of a chemical formula or diagram set at this point is not available. See text in hard copy or call BNA PLUS at 1-800-452-7773 or 202-452-4323.

wherein R₂ is selected from the class consisting of hydrogen, lower-alkyl, lower-aralkyl, and lower-aryl, and R₃ is selected from the class consisting of lower-alkyl, lower-aralkyl, and lower-aryl, and R₄ is selected from the class consisting of hydrogen, a hydrocarbon carboxylic acid acyl radical containing from two to twelve carbon atoms, inclusive, and a halo-, hydroxy-, lower-alkoxy-, amino-, cyano-, thiocyano-, and nitro-substituted hydrocarbon carboxylic acid acyl radical containing from two to twelve carbon atoms, inclusive.

That claim stands rejected under 35 U.S.C. 103 as unpatentable over prior art, on this record limited solely to the De Boer et al. patent² (De Boer) which discloses a compound with the structural formula:

Graphic material consisting of a chemical formula or diagram set at this point is not available. See text in hard copy or call BNA PLUS at 1-800-452-7773 or 202-452-4323.

As we noted in our original opinion, the controversy here is limited to the substituent A at the 6-position of the purine ring system. Although a compound having De Boer's structure is not included in the appealed claim since A in the claim cannot be an unsubstituted or primary amino,

Graphic material consisting of a chemical formula or diagram set at this point is not available. See text in hard copy or call BNA PLUS at 1-800-452-7773 or 202-452-4323.

, the basic structure of the De Boer compound is similar to the structure of appellant's alkylamino and dialkylamino compounds.³

Despite this close structural similarity between the De Boer amino compound and the alkylamino and dialkylamino compounds included in the appealed claim, appellant chose not to submit a showing of unexpected properties in his claimed compounds.⁴ Appellant asserted that his compounds were unobvious and patentable without such a showing. He urged that De Boer does not teach one of ordinary skill in the art how to make appellant's claimed compounds, and the examiner did not cite any other reference telling how they might be made. Therefore, in appellant's view, his claimed compounds are not in possession of the public, *In re Brown*, 51 CCPA 1254, 329 F.2d 1066, 141 USPQ 245 (1964).⁵

In support of his position, appellant submitted an affidavit by Dr. Paul F. Wiley relating to the unavailability to the public of processes for preparing appellant's alkylamino and dialkylamino compounds.⁶ Dr. Wiley's qualifications

Page 599

and competence as an expert to state facts and opinion in this area of chemistry were not challenged.

Regarding the Wiley affidavit, the examiner stated, in his Answer:

The affidavit * * * does not appear to be pertinent to the claim now on appeal because it is directed to the processes by which the De Boer et al. and appellant's compounds are prepared, and shows nothing unobvious for the

instantly claimed compound.

Concerning the Wiley affidavit, the board cited a statement of this court in *In re Riden*, 50 CCPA 1411, 318 F.2d 761, 138 USPQ 112 (1963), to the effect that "the method of making the compounds is a relevant fact to be considered in the question of obviousness of the compounds," 50 CCPA at 1415, 318 F.2d at 764, 138 USPQ at 114-115. But the board continued:

* * * This may be so but it is only one factor and, in our opinion, should never be the overriding one which appellant is here, in effect, urging.

Appellant states the first of two central questions to be decided in this rehearing as follows:

1) Appellant will admit his compounds are obvious and unpatentable *if* an obvious process is available to make them. Does it follow then that appellant's compounds are unobvious and patentable if an obvious process is *not* available to make them?

[2] Within this context, appellant simplifies that question to: Is process obviousness relevant in deciding compound obviousness? ⁷

The solicitor responds to the latter characterization of the question in the affirmative, pointing out that the first question bears on the principle implicit in *In re Brown*, *supra*, that claimed compounds not distinguished in their properties over closely related prior art compounds are unpatentable thereover where the claimed compounds would be "in possession of the public" in that a process for preparing them would be obvious to those of ordinary skill in the art.

In addition, the solicitor now refers to our prior opinion in which we noted that the facts in this case are closely analogous to those of *In re Riden*, *supra*, where we stated that the fact that the method of making the claimed compound is relevant, 54 CCPA at—, 379 F.2d at 1010, 154 USPQ at 172.

A recurring problem of analysis which confronted us as we prepared our previous opinion, and which still confronts us after the rehearing, has its genesis in a proper understanding of the issue as framed by appellant. In effect, appellant agrees that since the claimed product is a homolog of a known compound, it would be *prima facie* "obvious" under 35 U.S.C. 103. But this agreement is conditioned on the proviso that there is in the prior art an "obvious" process by which to make that compound.

[3] In the context of section 103, we are not permitted to fragment a claimed invention in applying that section. The clear mandate of the statute which governs our analysis requires that

Page 600

we consider the *invention as a whole* in making the determination.

[4] Thus, as we apply the statute to the present invention, we must ask first, what is the invention as a whole? Necessarily, by elementary patent law principles, it is the claimed compound, but, so considered, unless there is some known or obvious way to make the compound, the invention is nothing more than a mental concept expressed in chemical terms and formulae on a paper.

We are certain, however, that the invention as a whole is the claimed compound *and* a way to produce it, wherefore appellant's argument has substance. There has been no showing by the Patent Office in this record that the claimed compound can exist because

there is no showing of a known or obvious way to manufacture it; hence, it seems to us that the "invention as a whole," which section 103 demands that we consider, is not obvious from the prior art of record.

While there are valid reasons based in public policy as to why this defect in the prior art precludes a finding of obviousness under section 103, *In re Brown*, supra, its immediate significance in the present inquiry is that it poses yet *another difference* between the claimed invention and the prior art which *must* be considered in the context of section 103. So considered, we think the differences between appellant's *invention as a whole* and the prior art are such that the claimed invention would not be obvious within the contemplation of 35 U.S.C. 103.

[5] While 35 U.S.C. 102 is not *directly* involved in the issue on review, the conditions for patentability, novelty and loss of right to patent, there stated, may have relevance as to the disclosure which must be found in the prior art to find obviousness of an invention under section 103. In determining that quantum of prior art disclosure which is necessary to declare an applicant's invention "not novel" or "anticipated" within section 102, the stated test is whether a reference contains an "enabling disclosure," in the present context, a process by which the claimed compound could be made. In *In re LeGrice*, 49 CCPA 1124, 301 F.2d 929, 133 USPQ 365 (1962), we observed that the resolution of this issue required us to determine whether, *as a matter of law*, a reference without such a disclosure constituted a statutory time bar to an applicant's right to a patent. There, the issue was founded on 35 U.S.C. 102(b), not 103, but our conclusions have a certain pertinence here. We concluded, *id.* at 1134, 301 F.2d at 936, 133 USPQ at 372:

We think it is sound law, consistent with the public policy underlying our patent law, that before any publication can amount to a statutory bar to the grant of a patent, its disclosure must be such that a skilled artisan could take its teachings in *combination with his own knowledge of the particular art and be in possession of the invention*. * * *

In *In re Brown*, supra, this court discussed *In re Von Bramer*, 29 CCPA 1018, 127 F.2d 149, 53 USPQ 345 (1942), commenting that that opinion should not be construed to encompass what had come to be called the "Von Bramer doctrine." There we stated, 51 CCPA at 1257, 329 F.2d at 1009, 141 USPQ at 247:

* * * This doctrine, which appears to have resulted from *In re Von Bramer et al.*, supra, seems over a period of years to have been tailored in some quarters to a principle which defeats the novelty of a chemical compound on the basis of a mere printed conception or a mere printed contemplation of a chemical "compound" *irrespective of the fact that so-called "compound" described in the reference is not in existence or that there is no process shown in the reference for preparing the compound, or that there is no process known to a person having ordinary skill in the relevant art for preparing the compound*. In other words, a mere formula or a mere sequence of letters which constitute the designation of a "compound," is considered adequate to show that a compound in an application before the Patent Office, which compound is designated by the same formula or the same sequence of letters, is old. We do not think that the Von Bramer case should be so construed. [Emphasis added.]

To the extent that anyone may draw an inference from the Von Bramer case that the *mere* printed conception or the *mere* printed contemplation which

constitutes the designation of a "compound" is sufficient to show that such a compound is old, regardless of whether the compound is involved in a 35 U.S.C. 102 or 35 U.S.C. 103 rejection, we totally disagree. * * * [Footnotes omitted.]

We concluded, relying on *In re Le Grice*, supra, and *E. I. du Pont de Nemours & Co. v. Ladd*, 328 F.2d 547, 140 USPQ 297 (D.C. Cir. 1964), that the "true test of any prior art relied on to show or suggest that a chemical compound is old, is whether the prior

Page 601

art is such as to place the disclosed 'compound' in the *possession of the public*. " 51 CCPA at 1259, 329 F.2d at 1011, 141 USPQ at 249.

While *In re Le Grice* was bottomed on an issue arising under 35 U.S.C. 102 where the reference was a "printed publication," that test, in our view, is also properly applicable to issues arising under 35 U.S.C. 103. See *In re Brown*, supra (pertinent portion quoted above); *Deutsche Gold-Und Silber-Scheideanstalt v. Commissioner*, 251 F.Supp. 624, 629-630, 148 USPQ 412, 416 (D.D.C. 1966), affirmed, ___ F.2d ___, 157 USPQ 549 (D.C. Cir. 1968).

[6] Thus, upon careful reconsideration it is our view that if the prior art of record fails to disclose or render obvious a method for making a claimed compound, at the time the invention was made, it may not be legally concluded that the compound itself is in the possession of the public.⁸ In this context, we say that the absence of a known or obvious process for making the claimed compounds overcomes a presumption that the compounds are obvious, based on close relationships between their structures and those of prior art compounds.

The second aspect of the questions presented by this rehearing involves the issue of whether the burden is on the Patent Office to provide the evidence on which to predicate process obviousness.

35 U.S.C. 101 states, in its preamble, that an applicant is *entitled* to a patent *unless* certain patent-defeating provisions are met. The substantive patent-defeating provisions are encompassed in 35 U.S.C. 100-103.

[7] As we have stated, the Patent Office search resulted in citation of the De Boer reference which, under the prevailing law, rendered appellant's claimed compounds *prima facie* obvious. In other words, its citation shifted to appellant the burden of going forward with contrary evidence. Appellant filed the affidavit of Dr. Wiley which points out as a fact that De Boer—the only reference being relied on—does not disclose a process for producing the different compounds here claimed.

We think that portion of the Wiley affidavit set forth, supra note 6, states facts which were legally sufficient to overcome the position of the Patent Office as to the legal effect under section 103 of the De Boer reference.⁹ Appellant's responsibility to overcome this reference as a "patent-defeating" reference under section 103 at that point in the prosecution was only to overcome De Boer as a reference pertinent to the issue of obviousness under section 103.

We think the Wiley affidavit is clearly sufficient for this purpose. The affidavit points out that there is no indication in the De Boer patent that the fermentation process used to produce De Boer's compounds could be used to produce appellant's compounds. Since we are of the view that the method for making the compounds is an integral part of the "invention as a whole" which we must consider under section 103, we conclude that the

the *Graham* factual inquiries. It should be noted that the Supreme Court's application of the *Graham* test to the fact circumstances in *Ag Pro* was somewhat stringent, as it was in *Black Rock*. Note *Republic Industries, Inc. v. Schlage Lock Co.*, 592 F.2d 963, 200 USPQ 769 (7th Cir. 1979). The Court of Appeals for the Federal Circuit stated in *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1540, 218 USPQ 871, 880 (Fed. Cir. 1983) that

A requirement for "synergism" or a "synergistic effect" is nowhere found in the statute, 35 U.S.C. When present, for example in a chemical case, synergism may point toward nonobviousness, but its absence has no place in evaluating the evidence on obviousness. The more objective findings suggested in *Graham*, supra, are drawn from the language of the statute and are fully adequate guides for evaluating the evidence relating to compliance with 35 U.S.C. § 103. *Bowser Inc. v. United States*, 388 F.2d 346, 156 USPQ 406 (Ct. Cl. 1967).

BASIC CONSIDERATIONS WHICH APPLY TO OBVIOUSNESS REJECTIONS

When applying 35 U.S.C. 103, the following tenets of patent law must be adhered to:

- (A) The claimed invention must be considered as a whole;
- (B) The references must be considered as a whole and must suggest the desirability and thus the obviousness of making the combination;
- (C) The references must be viewed without the benefit of impermissible hindsight vision afforded by the claimed invention; and
- (D) Reasonable expectation of success is the standard with which obviousness is determined.

Hodosh v. Block Drug Co., Inc., 786 F.2d 1136, 1143 n.5, 229 USPQ 182, 187 n.5 (Fed. Cir. 1986).

OBJECTIVE EVIDENCE MUST BE CONSIDERED

Objective evidence or secondary considerations such as unexpected results, commercial success, long-felt need, failure of others, copying by others, licensing, and skepticism of experts are relevant to the issue of obviousness and must be considered in every case in which they are present. When evidence of any of these secondary considerations is submitted, the examiner must evaluate the evidence. The weight to be accorded to the evidence depends on the individual

factual circumstances of each case. *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983); *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 231 USPQ 81 (Fed. Cir. 1986), cert. denied, 480 U.S. 947 (1987). The ultimate determination on patentability is made on the entire record. *In re Oetiker*, 977 F.2d 1443, 1446, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992).

See MPEP § 716- § 716.06 for a discussion of objective evidence and its role in the final legal determination of whether a claimed invention would have been obvious under 35 U.S.C. 103.

2141.01 Scope and Content of the Prior Art

I. PRIOR ART AVAILABLE UNDER 35 U.S.C. 102 IS AVAILABLE UNDER 35 U.S.C. 103

"Before answering *Graham's* 'content' inquiry, it must be known whether a patent or publication is in the prior art under 35 U.S.C. § 102." *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1568, 1 USPQ2d 1593, 1597 (Fed. Cir.), cert. denied, 481 U.S. 1052 (1987). Subject matter that is prior art under 35 U.S.C. 102 can be used to support a rejection under section 103. *Ex parte Andresen*, 212 USPQ 100, 102 (Bd. Pat. App. & Inter. 1981) ("it appears to us that the commentator [of 35 U.S.C.A.] and the [congressional] committee viewed section 103 as including all of the various bars to a patent as set forth in section 102.").

A 35 U.S.C. 103 rejection is based on 35 U.S.C. 102(a), 102(b), 102(e), etc. depending on the type of prior art reference used and its publication or issue date. For instance, an obviousness rejection over a U.S. patent which was issued more than 1 year before the filing date of the application is said to be a statutory bar just as if it anticipated the claims under 35 U.S.C. 102(b). Analogously, an obviousness rejection based on a publication which would be applied under 102(a) if it anticipated the claims can be overcome by swearing behind the publication date of the reference by filing an affidavit or declaration under 37 CFR 1.131.

For an overview of what constitutes prior art under 35 U.S.C. 102, see MPEP § 901 - § 901.06(d) and § 2121 - § 2129.

II. SUBSTANTIVE CONTENT OF THE PRIOR ART

See MPEP § 2121 - § 2129 for case law relating to the substantive content of the prior art (e.g., availability of inoperative devices, extent to which prior art must be enabling, broad disclosure rather than preferred embodiments, admissions, etc.).

III. CONTENT OF THE PRIOR ART IS DETERMINED AT THE TIME THE INVENTION WAS MADE TO AVOID HINDSIGHT

The requirement "at the time the invention was made" is to avoid impermissible hindsight. See MPEP § 2145, paragraph X.A. for a discussion of rebutting applicants' arguments that a rejection is based on hindsight.

"It is difficult but necessary that the decisionmaker forget what he or she has been taught . . . about the claimed invention and cast the mind back to the time the invention was made (often as here many years), to occupy the mind of one skilled in the art who is presented only with the references, and who is normally guided by the then-accepted wisdom in the art." *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303, 313 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984).

IV. 35 U.S.C. 103(c) — EVIDENCE REQUIRED TO SHOW CONDITIONS OF 35 U.S.C. 103 APPLY

An applicant who wants to avail himself or herself of the benefits of 35 U.S.C. 103(c) has the burden of establishing that subject matter which qualifies as prior art under subsection (e), (f) or (g) of section 102 and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person. *Ex parte Yoshino*, 227 USPQ 52 (Bd. Pat. App. & Inter. 1985). Note that for applications filed prior to November 29, 1999, 35 U.S.C. 103(c) is limited on its face to subject matter developed by another person which qualifies as prior art only under subsection (f) or (g) of section 102. See MPEP § 706.02(l)(1). See also *In re Bartfeld*, 925 F.2d 1450, 1453-54, 17 USPQ2d 1885, 1888 (Fed. Cir. 1991) (Applicant attempted to overcome a 35 U.S.C. 102(e)/103 rejection

with a terminal disclaimer by alleging that the public policy intent of 35 U.S.C. 103(c) was to prohibit the use of "secret" prior art in obviousness determinations. The court rejected this argument, holding "We may not disregard the unambiguous exclusion of § 102(e) from the statute's purview.").

See MPEP § 706.02(l)(2) for the requirements which must be met to establish common ownership.

2141.01(a) Analogous and Nonanalogous Art

TO RELY ON A REFERENCE UNDER 35 U.S.C. 103, IT MUST BE ANALOGOUS PRIOR ART

The examiner must determine what is "analogous prior art" for the purpose of analyzing the obviousness of the subject matter at issue. "In order to rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned." *In re Oetiker*, 977 F.2d 1443, 1446, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992). See also *In re Deminski*, 796 F.2d 436, 230 USPQ 313 (Fed. Cir. 1986); *In re Clay*, 966 F.2d 656, 659, 23 USPQ2d 1058, 1060-61 (Fed. Cir. 1992) ("A reference is reasonably pertinent if, even though it may be in a different field from that of the inventor's endeavor, it is one which, because of the matter with which it deals, logically would have commended itself to an inventor's attention in considering his problem."); and *Wang Laboratories Inc. v. Toshiba Corp.*, 993 F.2d 858, 26 USPQ2d 1767 (Fed. Cir. 1993).

PTO CLASSIFICATION IS SOME EVIDENCE OF ANALOGY, BUT SIMILARITIES AND DIFFERENCES IN STRUCTURE AND FUNCTION CARRY MORE WEIGHT

While Patent Office classification of references and the cross-references in the official search notes are some evidence of "nonanalogy" or "analogy" respectively, the court has found "the similarities and differences in structure and function of the inventions to carry far greater weight." *In re Ellis*, 476 F.2d 1370, 1372, 177 USPQ 526, 527 (CCPA 1973) (The structural similarities and functional overlap between the structural gratings shown by one reference and the

In re WESSLAU

(CCPA)

147 USPQ 391

Decided Nov. 26, 1965

Appl. No. 7447

U.S. Court of Customs and Patent Appeals

Headnotes

PATENTS

1. Patentability--Composition of matter (§ 51.30)

Claims to process of polymerizing ethylene are not rejected on theory that applicant's catalyst system can be met merely by substitution of groups from two prior patents on the corresponding components of a third prior system since no one of the references suggests such a substitution, quite apart from the result which would be obtained thereby; such piecemeal reconstruction of prior art patents in light of applicant's disclosure is contrary to 35 U.S.C. 103.

2. Patentability--Invention--In general (§ 51.501)

Question in cases within ambit of 35 U.S.C. 103 is whether subject matter as a whole would have been obvious to one of ordinary skill in the art following teachings of prior art at time invention was made; it is impermissible within framework of section 103 to choose from any one reference only so much of it as will support a given position, to exclusion of other parts necessary to full appreciation of what reference fairly suggests to one of ordinary skill in the art.

Particular patents--Polyethylene

Wesslau, Process for the Production of Polyethylene with Narrow Distribution of the Molecular Weight, claims 35 to 43 of application allowed.

Case History and Disposition:

Appeal from Board of Appeals of the Patent Office.

Application for patent of Hermann Wesslau, Serial No. 753,872, filed Aug. 8, 1959; Patent Office Group 140. From decision rejecting claims 35 to 43, applicant appeals. Reversed.

Attorneys:

ARNOLD SPRUNG, New York, N.Y., and ARNOLD B. CHRISTEN, Washington, D. C., for appellant.

CLARENCE W. MOORE (FRED W. SHERLING of counsel) for Commissioner of Patents.

Judge:

Before WORLEY, Chief Judge, and RICH, MARTIN, SMITH, and ALMOND, Associate Judges.

Opinion Text**Opinion By:**

ALMOND, Judge.

This appeal is from the decision of the Board of Appeals affirming the rejection of claims 35-43 ¹ in appellant's application ² entitled "Process for the Production of Polyethylene With Narrow Distribution of the Molecular Weight." No claims have been allowed.

The invention relates to a process of polymerizing ethylene utilizing a Ziegler-type catalyst system to produce solid polyethylene. Both appellant and the Patent Office have treated the appealed process claims as standing or falling together, and we will do the same. Claim 35, from which the remaining claims depend, is illustrative and reads as follows:

35. In the process of polymerizing ethylene to a solid polymer having a high molecular weight and a narrow molecular weight distribution range, the improvement which comprises polymerizing ethylene in the presence of a polymerization catalyst con

sisting essentially of a mixture of titanium trichloride, at least one compound of tetravalent titanium $Ti(R)_4$ and at least one organic aluminum compound soluble in a liquid hydrocarbon and having the general formula $R'Al(R)_2$ in which R' is alkyl and R is selected from the group consisting of halogen, alkoxy and aroxy radicals, wherein between said tetravalent titanium compound and said organic aluminum compound there is present in said mixture at least one halogen atom

and at least one member selected from the group consisting of alkoxy and aroxy radicals.

According to appellant's disclosure, polyethylene of high molecular weight may be produced by what has become known in the art as the Ziegler polymerization process. Analysis of the polyethylene so produced has revealed that although the *average* molecular weight of the polymer is high, a fairly large proportion of the individual polymer chains have a relatively low molecular weight. These low molecular weight fractions are particularly unfavorable for such properties as impact bending strength, rubbing, and fatigue. Appellant has discovered that the proportion of the lower molecular weight chains can be reduced, thereby narrowing the molecular weight distribution, by employing a three-component catalyst system in which either the $Ti(R)_4$ or $R'Al(R)_2$ contains an alkoxide or aroxide moiety.

The references relied on are:

Anderson 2,862,917 December 2, 1958

Muehlbauer 2,905,661 September 22, 1959

Ruhrchemie (Belgian) 553,694 June 24, 1957

The Ruhrchemie patent relates to a process for producing polyethylene of a desired molecular weight employing certain specified catalyst systems. The pertinent portion of the patent specification reads as follows:

*** when high molecular weight [polyethylene] products are to be obtained ***, the employed mixtures consist of aluminum alkyl compounds and/or halides of aluminum alkyl with quantities of titanium trichloride of at least 0.01 mole *** and quantities of titanium tetrachloride lower than 0.01 mole ***; on the other hand, when materials having low molecular weight are to be obtained the employed mixtures consist of aluminum alkyl and/or halide of aluminum alkyl with more than 0.1 mole *** of titanium tetrachloride per mole of aluminum alkyl and/or halide of aluminum alkyl, and with titanium trichloride at the rate of at least 0.1 mole, preferably 0.3-1 mole approximately per mole of aluminum alkyl and/or halide of aluminum alkyl.

The Anderson patent relates to a process of polymerizing ethylene whereby control over the weight average molecular weight of the polymer and the *molecular weight distribution* of the polymer is achieved by adhering to process conditions which insure the solubility of the ethylene during polymerization. The process employs coordination catalysts of titanium:

*** obtained by admixing a trivalent or tetravalent titanium compound of the class consisting of titanium salts and titanium alkoxides with a compound having at least one metal-to-hydrocarbon bond, such as metal alkyls, suitable compounds being lithium aluminum alkyls, aluminum alkyls, Grignard reagents, alkyl aluminum halides, tin alkyls, etc. ***

Anderson further states:

*** the steady state compliance [an indicia of molecular weight distribution] will vary from 3 to 7 when the critical conditions of the process of the present invention are maintained and will rise to a range of 12 to 28 when the polymerization is carried out at conditions other than required by the process of the present invention. ***

Muehlbauer relates to a process for producing high molecular weight polyolefins

employing a two-component catalyst system consisting of certain metal halides and a compound of the formula $XAIR(OR')$, where X is halogen, and R and R' are the same or different alkyl, cycloalkyl, or aryl radicals. Titanium trichloride and titanium tetrachloride are specifically disclosed as suitable metal halides.

The sole issue in this case is obviousness under 35 U.S.C. 103.

Appellant's principal contention is that:

* * * since none of the reference[s] either singly or in combination teach a control of the molecular weight distribution range by specific selection of catalyst components, or even that the nature or composition of the catalyst could have an effect on this molecular weight distribution range, the subject matter of the invention as a whole could not possibly be obvious from the references. * * *

Page 393

We agree. Appellant's specification contains ten examples in which various three-component catalyst systems were utilized in the polymerization of ethylene. The systems set forth in three of these examples consisted of (1) titanium trichloride, (2) titanium tetrachloride, and (3) diethyl aluminum monochloride in various molar ratios. These fall within the catalyst systems disclosed by Ruhrchemie. The U value, which according to appellant's specification is a measure of the molecular weight distribution, ranges from 6.3 to 12.8 for such catalysts. In the remaining seven examples, catalyst systems covered only by the appealed claims were employed, with the nonuniformity value U^3 for the resultant polyethylene ranging from 2.6 to 3.9. We believe this to be a convincing demonstration that the alkoxide or aroxide moiety, when present in the catalyst systems of the appealed claims, possesses the property of conferring a significant degree of control over the ultimate molecular weight distribution of polyethylene. This property is neither taught nor suggested by the prior art.

The reasoning of the examiner and the board appears to be as follows: Ruhrchemie discloses a titanium trichloride - titanium tetrachloride - mono - ethyl aluminum dichloride system. This differs from appellant's system only in the latter's use of an alkoxide or aroxide group on either the tetravalent titanium or aluminum component or both. Since Anderson shows a tetravalent titanium compound containing an alkoxide group and Muehlbauer shows an aluminum compound containing an alkoxide group, appellant's catalyst system can be met merely by substitution of such alkoxide groups on the corresponding components of the Ruhrchemie system.

[1] The fallacy of this reasoning is that no one of the references *suggests* such a substitution, quite apart from the result which would be obtained thereby. Such piecemeal reconstruction of the prior art patents in the light of appellant's disclosure is contrary to the requirements of 35 U.S.C. 103. In *re Rothermel*, 47 CCPA 866, 276 F.2d 393, 125 USPQ 328.

[2] The ever present question in cases within the ambit of 35 U.S.C. 103 is whether the subject matter as a whole would have been obvious to one of ordinary skill in the art following the *teachings* of the prior art at the time the invention was made. It is impermissible within the framework of section 103 to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of

ordinary skill in the art. The Anderson patent is the only reference before us which recognizes the desirability of producing polyethylene with a narrow molecular weight distribution range. Were one to follow the teachings of that patent in its entirety, he would be led to believe that control over the molecular weight distribution of polyethylene was gained independently of the catalyst system, a belief untenable in light of appellant's disclosure.

Both the board and the solicitor apparently assert the position that it is incumbent upon appellant to show that his results are outstanding as compared with the results accomplished by Anderson and Muehlbauer. If this is construed as requiring appellant to show unexpected results accruing from his claimed process, we think he has met the requirement. We perceive no teaching in the prior art of record suggesting that an alkoxide or aroxide moiety in a Ziegler-type catalytic system would produce the results obtained by appellant's process.

The decision of the board is *reversed*.

Footnotes

Footnote 1. Appellant withdrew the appeal with respect to the only product claim 44, which was drawn to a polyethylene having a narrow molecular weight distribution characterized by a nonuniformity value U of magnitude between 2 and 4.

Footnote 2. Serial No. 753,872, filed August 8, 1958.

Footnote 3. Appellant's specification contains the following description of the nonuniformity value U:

* * * the so-called non-uniformity is used for characterising the range of distribution of the molecular weights. According to G. V. Schulz in H. A. Stuart's Die Physik der Hochpolymeren, 2nd vol., the macromolecule in solutions is given on page 754 as:

Graphic material consisting of a complex mathematical formula set at this point is not available. See text in hard copy or call BNA PLUS at 1-800-452-7773 or 202-452-4323.

\bar{M}_w and \bar{M}_n can be calculated from the molecular weight distribution by current methods (G. V. Schulz and M. Marx: Makromolekulare Chemie XIV (1954), pages 53-64).

- End of Case -

FULL TEXT OF CASES (USPQ2D)

All Other Cases

In re Oetiker (CA FC) 24 USPQ2d 1443 In re Oetiker

U.S. Court of Appeals Federal Circuit
24 USPQ2d 1443

Decided October 13, 1992

No. 91-1026

Headnotes

PATENTS

1. Practice and procedure in Patent and Trademark Office -- Prosecution -- In general (§ 110.0901)

Patentability/Validity -- Obviousness -- In general (§ 115.0901)

"Prima facie" case is procedural tool of patent examination which allocates burdens of going forward as between examiner and applicant; examiner bears initial burden, on review of prior art or on any other ground, of presenting prima facie case of unpatentability, and if that burden is met, burden of coming forward with evidence or argument shifts to applicant, and after applicant submits such evidence in response, patentability is determined on totality of record, by preponderance of evidence with due consideration to persuasiveness of argument.

2. Practice and procedure in Patent and Trademark Office -- Board of Patent Appeals and Interferences -- In general (§ 110.1101)

Board of Patent Appeals and Interferences, in reviewing examiner's decision on appeal, must necessarily weigh all evidence and argument, and board's observation that examiner made prima facie case of unpatentability is not improper, as long as ultimate

determination of patentability is made on entire record.

3. Practice and procedure in Patent and Trademark Office -- Prosecution -- In general (§ 110.0901)

Patentability/Validity -- Obviousness -- In general (§ 115.0901)

Concept of "prima facie" case of obviousness, which places initial burden on examiner, is of broad applicability and is not limited to chemical practice; that prima facie case may be established, or rebutted, by different forms of evidence in various technologies does not restrict concept to any particular field of technology.

4. Patentability/Validity -- Obviousness -- Relevant prior art -- In general (§ 115.0903.01)

Patentability/Validity -- Obviousness -- Combining references (§ 115.0905)

Prior art reference, in order to be relied upon as basis for rejecting applicant's invention, must either be in field of applicant's endeavor or, if not, be reasonably pertinent to particular problem with which inventor was concerned; combination of elements from non-analogous sources, in manner that reconstructs applicant's invention only with benefit of hindsight, is insufficient to present prima facie case of obviousness.

5. Patentability/Validity -- Obviousness -- In general (§ 115.0901)

Simplicity of invention is not itself inimical to patentability.

Case History and Disposition:

Page 1443

Appeal from the U.S. Patent and Trademark Office, Board of Patent Appeals and Interferences.

Application for patent, no. 06/942,694, filed by Hans Oetiker. From decision holding claims unpatentable, applicant appeals. Reversed; Nies, C.J., and Plager, J., concurring in separate opinions.

Attorneys:

Paul M. Craig, Jr., Washington, D.C., for appellant.

John W. Dewhirst (Fred E. McKelvey, solicitor and Robert D.

Edmonds, associate solicitor, with him on brief), for appellee.

Judge:

Before Nies, chief judge, and Newman and Plager, circuit judges.

Opinion Text

Opinion By:

Newman, J.

Hans Oetiker appeals the decision of the United States Patent and Trademark Office Board of Patent Appeals and Interferences, holding unpatentable claims 1-14 and 6-21, all of the claims in patent application No. 06/942,694. 1 Oetiker appeals on procedural and substantive grounds.

I *PROCEDURE* Background

All of the claims were finally rejected for obviousness in terms of 35 U.S.C. Section 103. The

Page 1444

Board, upholding the rejection, stated that "the examiner has . . . established a *prima facie* case of obviousness . . . which is unrebutted by any objective evidence of nonobviousness". Oetiker stated that this Board holding was the first rejection of his claims for being "*prima facie* obvious", and filed rebuttal evidence with a petition for reconsideration. The Board declined to consider the new evidence or change its decision.

Oetiker states that a holding of *prima facie* obviousness means, in patent examination, that the claimed invention is subject to a rebuttable presumption of obviousness; that is, if the applicant can provide evidence or argument in support of unobviousness, such evidence and argument will be considered, and the question of patentability will be redetermined on the entire record. Oetiker states that a rejection made in the words "*prima facie* obvious" is understood by patent examiners and practitioners as an invitation to provide such rebuttal evidence.

Thus Oetiker argues that a holding by the Board of *prima facie* obviousness is a new ground of rejection, for during prosecution the examiner did not reject the claims in these words. Treating it as such, Oetiker offered affidavit evidence not previously filed, and requested reconsideration on the basis of this new evidence, or remand to the examiner for this purpose, in accordance with 37 C.F.R. Section 1.196(b):

Section 1.196(b) . . . When the Board . . . makes a new rejection of an appealed claim, the appellant may exercise either of the following two options . . . :

- (1) The appellant may submit . . . a showing of facts . . . and have the matter reconsidered by the examiner in which event the application will be remanded to the examiner.
- (2) The appellant may have the case reconsidered under Section 1.197(b) by the Board . . . upon the same record.

The Board on reconsideration granted neither of the options of Section 1.196(b), stating that it had not made a new rejection.

At argument before this court the Commissioner's counsel suggested that Oetiker could refile his patent application, pay a new fee, and obtain review of this new evidence in a new examination. Oetiker states that he was entitled to a complete examination, and did not get it.

Discussion

[1] The *prima facie* case is a procedural tool of patent examination, allocating the burdens of going forward as between examiner and applicant. *In re Spada*, 911 F.2d 705, 707 n.3, 15 USPQ2d 1655, 1657 n.3 (Fed. Cir. 1990). The term "*prima facie* case" refers only to the initial examination step. *In re Piasecki*, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984); *In re Rinehart*, 531 F.2d 1048, 1052, 189 USPQ 143, 147 (CCPA 1976). As discussed in *In re Piasecki*, the examiner bears the initial burden, on review of the prior art or on any other ground, of presenting a *prima facie* case of unpatentability. If that burden is met, the burden of coming forward with evidence or argument shifts to the applicant.

After evidence or argument is submitted by the applicant in response, patentability is determined on the totality of the record, by a preponderance of evidence with due consideration to persuasiveness of argument. See *In re Spada*, *supra*; *In re Corkill*, 771 F.2d 1496, 1500, 226 USPQ 1005, 1008 (Fed. Cir. 1985); *In re Caveny*, 761 F.2d 671, 674, 226 USPQ 1, 3 (Fed. Cir. 1985); *In re Johnson*, 747 F.2d 1456, 1460, 223 USPQ 1260, 1263 (Fed. Cir. 1984).

If examination at the initial stage does not produce a *prima facie* case of unpatentability, then without more the applicant is entitled to grant of the patent. See *In re Grabiak*, 769 F.2d 729, 733, 226 USPQ 870, 873 (Fed. Cir. 1985); *In re Rinehart*, *supra*.

[2] In reviewing the examiner's decision on appeal, the Board must necessarily weigh all of the evidence and argument. An observation by the Board that the examiner made a *prima facie* case is not improper, as long as the ultimate determination of patentability is made on the entire record. *In re Piasecki*, 745 F.2d at 1472, 223 USPQ at 788; *In re Rinehart*, 531 F.2d at 1052, 189 USPQ at 147.

The record here reveals that the application was fully prosecuted. References were cited and applied by the examiner, the applicant responded with argument, and the examiner then issued a final rejection, stating why he was not persuaded by the applicant's argument. On review the Board stated that its decision was reached "after careful consideration of the appealed claims, the evidence of obviousness relied upon by the examiner and the arguments advanced by the appellant and the examiner". The Board explained why it was unpersuaded by Oetiker's arguments on appeal. We discern no irregularity in the procedure. The Board, in explaining that the examiner's rejections constituted a *prima facie* case of obviousness, did not make a new rejection.

[3] Oetiker also argues that the concept of a "*prima facie* case of obviousness" has no role outside of the chemical arts. Oetiker

refers to the origins of this term in the chemical practice, where properties may not be apparent from chemical structure. Oetiker distinguishes mechanical inventions, where the properties and workings of a mechanical device are apparent in the drawing of the

structure. We think that the PTO is correct in treating the concept of the *prima facie* case as of broad applicability, for it places the initial burden on the examiner, the appropriate procedure whatever the technological class of invention. That a *prima facie* case may be established, or rebutted, by different forms of evidence in various technologies does not restrict the concept to any particular field of technology. " [T]he requirement of unobviousness in the case of chemical inventions is the same as for other types of inventions". *In re Johnson*, 747 F.2d at 1460, 223 USPQ at 1263. This procedural tool is recognized in fields outside of the chemical arts. *E.g., In re Benno*, 768 F.2d 1340, 226 USPQ 683 (Fed. Cir. 1985); *In re McCarthy*, 763 F.2d 411, 226 USPQ 99 (Fed. Cir. 1985); *In re De Blauwe*, 736 F.2d 699, 222 USPQ 191 (Fed. Cir. 1984).

The Board's usage of the term *prima facie* was imprecise for, as discussed *supra*, the term "*prima facie* obvious" relates to the burden on the examiner at the initial stage of the examination, while the conclusion of obviousness *vel non* is based on the preponderance of evidence and argument in the record. However, it was clear that the Board did not make a new rejection. Therefore the Board did not err in declining to consider at that stage the proffered evidence of commercial success.

II THE MERITS

Oetiker's invention is an improvement in a "stepless, earless" metal clamp, a hose clamp that was generally described in an earlier '004 patent of Oetiker, but that differs in the presence of a feature that is described as a preassembly "hook". This "hook" serves both to maintain the preassembly condition of the clamp and to be disengaged automatically when the clamp is tightened.

The cited references were Oetiker's earlier-granted '004 patent, combined with a certain Lauro '400 patent. Lauro describes a plastic hook and eye fastener for use in garments, in which "unitary tabs of sewing needle puncturable plastic material . . . are affixable to clothing and the like by sewing". Oetiker argues that there is no suggestion or motivation to the artisan to combine the teachings of the cited references, and that Lauro is nonanalogous art. Oetiker concludes that these references were improperly combined; that a person of ordinary skill, seeking to solve the problem facing Oetiker, would not look to the garment art for the solution. Oetiker also argues that even if combined the references do not render the claimed combination obvious.

The examiner stated that "since garments commonly use hooks for securement", a person faced with the problem of unreliable maintenance of the pre-assembly configuration of an assembly line metal hose clamp would look to the garment industry art. The examiner explained further by stating that "Appellant's device as disclosed could be utilized as part of a garment". The Board did not repeat or support the examiner's argument, or discuss its relevance. Indeed, the argument is not supportable. However, the Board held that the Lauro reference, although not "within the appellant's specific field of endeavor" is nonetheless "analogous art" because it relates to a hooking problem, as does Oetiker's invention.

The Board apparently reasoned that all hooking problems are analogous. At least, that is the argument now pressed by the Commissioner. The Commissioner states in his brief on appeal that "A disengageable catch, such as that used by Oetiker, is a common everyday mechanical concept that is variously employed in door latches and electrical and other switches, as well as in the hook and eye apparatus disclosed by Lauro". No such

references were cited, however. While this court may take judicial notice of common everyday mechanical concepts in appropriate circumstances, the Commissioner did not explain why a "catch" of unstated structure in an electrical switch, for example, is such a concept and would have made Oetiker's invention obvious. Indeed, the Commissioner did not respond to Oetiker's argument that the cited references provide no teaching or suggestion that Lauro's molded hook and eye fastener, even if combined with Oetiker's '004 clamp, would achieve Oetiker's purpose.

[4] In order to rely on a reference as a basis for rejection of the applicant's invention, the reference must either be in the field of the applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned. *See In re Deminski*, 796 F.2d 436, 442, 230 USPQ 313, 315 (Fed. Cir. 1986). Patent examination is necessarily conducted by hindsight, with complete knowledge of the applicant's invention, and the courts have recognized the subjective aspects of determining whether an inventor would reasonably

Page 1446

be motivated to go to the field in which the examiner found the reference, in order to solve the problem confronting the inventor. We have reminded ourselves and the PTO that it is necessary to consider "the reality of the circumstances", *In re Wood*, 599 F.2d 1032, 1036, 202 USPQ 171, 174 (CCPA 1979) -- in other words, common sense -- in deciding in which fields a person of ordinary skill would reasonably be expected to look for a solution to the problem facing the inventor.

It has not been shown that a person of ordinary skill, seeking to solve a problem of fastening a hose clamp, would reasonably be expected or motivated to look to fasteners for garments. The combination of elements from non-analogous sources, in a manner that reconstructs the applicant's invention only with the benefit of hindsight, is insufficient to present a *prima facie* case of obviousness. There must be some reason, suggestion, or motivation found in the prior art whereby a person of ordinary skill in the field of the invention would make the combination. That knowledge can not come from the applicant's invention itself. *Diversitech Corp. v. Century Steps, Inc.*, 850 F.2d 675, 678-79, 7 USPQ2d 1315, 1318 (Fed. Cir. 1988); *In re Geiger*, 815 F.2d 686, 687, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987); *Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 1147, 227 USPQ 543, 551 (Fed. Cir. 1985).

[5] Oetiker's invention is simple. Simplicity is not inimical to patentability. *See Goodyear Tire & Rubber Co. v. Ray-O-Vac Co.*, 321 U.S. 275, 279, 60 USPQ 386, 388 (1944) (simplicity of itself does not negative invention); *Panduit Corp. v. Dennison Mfg Co.*, 810 F.2d 1561, 1572, 1 USPQ2d 1593, 1600 (Fed. Cir.) (the patent system is not foreclosed to those who make simple inventions), *cert. denied*, 481 U.S. 1052 (1987). We conclude that the references on which the Board relied were improperly combined. Accordingly, the Board erred in holding the claims unpatentable under section 103. The rejection of claims 1-4 and 16-21 is **REVERSED**.

Footnotes

Footnote 1. *Ex parte Oetiker*, No. 89-2230 (Bd. Pat App. & Interf. May 31, 1990; on

reconsideration, August 23, 1990).

Concurring Opinion Text

Concur By:

Nies, C.J., concurring.

I agree with the panel decision and write only to express my understanding of the language that there must be some teaching, reason, suggestion, or motivation found "in the prior art" or "in the prior art references" to make a combination to render an invention obvious within the meaning of 35 U.S.C. Section 103 (1988). Similar language appears in a number of opinions and if taken literally would mean that an invention cannot be held to have been obvious unless something specific in a prior art reference would lead an inventor to combine the teachings therein with another piece of prior art.

This restrictive understanding of the concept of obviousness is clearly wrong. Other statements in opinions express the idea more generally. We have stated, for example, that the test is: "whether the teachings of the prior art, taken as a whole, would have made obvious the claimed invention," *In re Gorman*, 933 F.2d at 986, 18 USPQ2d at 1888, and "what the combined teachings . . . would have suggested to one of ordinary skill in the art," *In re Young*, 927 F.2d 588, 591, 18 USPQ2d 1089, 1091 (Fed. Cir. 1991). We have also stated that "the prior art as a whole must suggest the desirability . . . of making the combination." *Uniroyal, Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 1051, 5 USPQ2d 1434, 1438 (Fed. Cir.), *cert. denied*, 488 U.S. 825 (1988); *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 1462, 221 USPQ 481, 488 (Fed. Cir. 1984).

I believe that it would better reflect the concept of obviousness to speak in terms of "from the prior art" rather than simply "in the prior art." The word "from" expresses the idea of the statute that we must look at the obviousness issue through the eyes of one of ordinary skill in the art and what one would be presumed to know with that background. What would be obvious to one of skill in the art is a different question from what would be obvious to a layman. An artisan is likely to extract more than a layman from reading a reference.

In any event, variance in the language used in opinions does not change the nature of the statutory inquiry. Under section 103, subject matter is unpatentable if it "would have been obvious . . . to a person having

Page 1447

ordinary skill in the art." While there must be some teaching, reason, suggestion, or motivation to combine existing elements to produce the claimed device, it is not necessary that the cited references or prior art specifically suggest making the combination. *In re Nilssen*, 851 F.2d 1401, 1403, 7 USPQ2d 1500, 1502 (Fed. Cir. 1988). Such suggestion or motivation to combine prior art teachings can derive solely from the existence of a teaching, which one of ordinary skill in the art would be presumed to know, and the use of that teaching to solve the same or similar problem which it addresses. *In re Wood*, 599 F.2d 1032, 1037, 202 USPQ 171, 174 (CCPA

1979). See, also, *EWP Corp. v. Reliance Universal, Inc.*, 755 F.2d 898, 906-07, 225 USPQ 20, 25 (Fed. Cir.), cert. denied, 474 U.S. 843 (1985); *In re Sernaker*, 702 F.2d 989, 995, 217 USPQ 1, 6 (Fed. Cir. 1983). See also, *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985) ("To support the conclusion that the claimed combination is directed to obvious subject matter, either the references must expressly or implicitly suggest the claimed combination or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.").

In sum, it is off the mark for litigants to argue, as many do, that an invention cannot be held to have been obvious unless a suggestion to combine prior art teachings is found in a specific reference.

Footnotes

Footnote 1. See, e.g., *Symbol Technologies, Inc. v. Opticon, Inc.*, 935 F.2d 1569, 19 USPQ2d 1241, 1246 (Fed. Cir. 1991); *In re Gorman*, 933 F.2d 982, 989, 18 USPQ2d 1885, (Fed. Cir. 1991); *In re Mills*, 916 F.2d 680, 682, 16 USPQ2d 1430, (Fed. Cir. 1990); *Smithkline Diagnostics, Inc. v. Helena Laboratories Corp.*, 859 F.2d 878, 887, 8 USPQ2d 1468, 1475 (Fed. Cir. 1988); *In re Dow Chemical Co.*, 837 F.2d 469, 473, 5 USPQ2d 1529, 1531 (Fed. Cir. 1988); *In re Stencel*, 828 F.2d 751, 755, 4 USPQ2d 1071, 1073 (Fed. Cir. 1987); *Ashland Oil, Inc. v. Delta Resins & Refractories, Inc.*, 776 F.2d 281, 293, 227 USPQ 657, 664 (Fed. Cir. 1985), cert. denied, 475 U.S. 1017 (1986); *In re Grabiak*, 769 F.2d 729, 732, 226 USPQ 870, 872 (Fed. Cir. 1985).

Concurring Opinion Text

Concur By:

Plager, J., concurring.

I join in the carefully-reasoned and well-written opinion of Judge Newman. With regard to Part I dealing with the PTO procedure, her explanation of the meaning and application of the 'prima facie case' concept should help clarify an area that remains marked by a lack of clarity. The need for that discussion, however, illustrates the pitfalls of the 'prima facie' practice of the PTO, and the difficulties created by this particular legalistically convoluted concept.

An applicant for a patent is entitled to the patent unless the application fails to meet the requirements established by law. It is the Commissioner's duty (acting through the examining officials) to determine that all requirements of the Patent Act are met. The burden is on the Commissioner to establish that the applicant is not entitled under the law to a patent. *In re Warner*, 379 F.2d 1011, 1016, 154 USPQ 173, 177 (CCPA 1967), cert. denied, 389 U.S. 1057 (1968). In rejecting an application, factual determinations by the PTO must be based on a preponderance of the evidence, and legal conclusions must be correct. *In re Caveney*, 761 F.2d 671, 674, 226 USPQ 1, 3 (Fed. Cir. 1985).

The process of patent examination is an interactive one. See generally, Chisum, *Patents*, Section 11.03 et seq. (1992). The examiner cannot sit mum, leaving the applicant to shoot arrows into the dark hoping to somehow hit a secret objection

harbored by the examiner. The 'prima facie case' notion, the exact origin of which appears obscure (*see In re Piasecki*, 745 F.2d 1468, 1472, 233 USPQ 785, 788 (Fed. Cir. 1984)), seemingly was intended to leave no doubt among examiners that they must state clearly and specifically any objections (the prima facie case) to patentability, and give the applicant fair opportunity to meet those objections with evidence and argument. To that extent the concept serves to level the playing field and reduces the likelihood of administrative arbitrariness.

But the ultimate decision that must be made by the PTO in the examination process, and by this court on appeal, is not whether a prima facie case for rejection was made; the only question is whether, on the whole record, the applicant has met the statutory requirements for obtaining a patent. When a final rejection is described in terms of whether a prima facie case was made, that intermediate issue diverts attention from what should be the question to be decided.

Specifically, when obviousness is at issue, the examiner has the burden of persuasion and therefore the initial burden of production. Satisfying the burden of production, and thus initially the burden of persuasion, constitutes the so-called prima facie showing. Once that burden is met, the applicant has the burden of production to demonstrate that the examiner's preliminary determination is not correct. The examiner, and if later involved, the Board, retain the ultimate burden of persuasion on the issue.

If, as a matter of law, the issue is in equipoise, the applicant is entitled to the patent. Thus on appeal to this court as in the PTO, the applicant does not bear the ultimate burden of persuasion on the issue. In the end there is no reason there or here to argue over whether a 'prima facie' case was made out. The only determinative issue is whether the record as a whole supports the legal conclusion that the invention would have been obvious.

- End of Case -

In re ELLIS
(CCPA)
177 USPQ 526
Decided Apr. 26, 1973
No. 8860
U.S. Court of Customs and Patent Appeals

Headnotes

PATENTS

1. Patentability — New use or function — Analogous art (§ 51.553)

Patentability — New use or function — Nonanalogous art (§ 51.557)

While diverse Patent Office classification of references is some evidence of nonanalogy and while cross-reference in official search notes is some evidence of analogy, similarities and differences in structure and function of inventions disclosed in references carry greater weight.

Particular patents—Grating

Ellis, Floor Grating, claims 1 to 5 of application refused.

Case History and Disposition:

Page 526

Appeal from Board of Appeals of the Patent Office.

Application for patent of William L. Ellis, Serial No. 618,203, filed Feb. 23, 1967; Patent Office Group 356. From decision rejecting claims 1 to 5, applicant appeals. Affirmed.

Attorneys:

FRANCIS D. THOMAS, JR., Washington, D.C., for appellant.

**S. WM. COCHRAN (JOHN W. DEWHIRST of counsel) for
Commissioner of Patents.**

Judge:

Before MARKEY, Chief Judge, RICH, BALDWIN, and LANE, Associate Judges,
and WATSON, Judge, United States Customs Court, sitting by designation.

Opinion Text

Opinion By:

BALDWIN, Judge.

This appeal is from the decision of the Patent Office Board of Appeals, sustaining the examiner's rejection of claims 1-5, all the claims in appellant's application. ¹

The Invention

The claimed invention relates to floor gratings, and can be sufficiently understood from a reading of claim 1 with reference to appellant's Figure 3:

Tabular, graphic, or textual material set at this point is not available. Please consult hard copy or call BNA PLUS at 1-800-452-7773 or 202-452-4323.

1. A floor grating, comprising: a plurality of main support members [12], a plurality of secondary support bars [16] supported by said members and extending in fixed parallel spaced relation therebetween,

a plurality of closely spaced wire rod members [18] secured to said secondary load bearing support bars and extended in parallel relation transversely thereacross for providing a walking surface thereover,

said secondary load bearing support bars being sufficiently deep and closely spaced to support said wire rod members for pedestrian traffic without undue flexing therebetween,

and said wire rod members being spaced in the order of $\frac{1}{4}$ inch or less apart and having an exposed upper surface area more than one-half the open spacing therebetween for providing a substantially contiguous walking surface for pedestrian traffic thereover and the passage of snow and dirt therethrough.

Claim 2 requires that the wire rod members be tapered, to more readily pass dirt and debris. Claims 3-5 differ from claim 2 in respects unnecessary to describe in detail here.

The Rejection

The claims were rejected under 35 U.S.C. 103 as being unpatentable over a patent to Schulz ² in view of a patent to Trixner. ³ Schulz deals with structural gratings which may be used for ceilings, walls, flooring for bridges, etc. While most of Schulz's gratings are filled with concrete in use, Schulz discloses an alternate opening grating not filled with concrete in Figure 8, page 527.

Trixner deals with non-clogging shoe scrapers. The application states:

Tabular, graphic, or textual material set at this point is not available. Please consult hard copy or call BNA PLUS at 1-800-452-7773 or 202-452-4323.

The scraper is advantageously constructed so that the gaps cannot be clogged and the individual cleaning elements can be easily removed and replaced, which greatly facilitates cleaning after extensive use and removal of worn individual scraper elements. According to the invention this result is obtained by detachably inserting the channel-shaped rods which receive the rubber elements in corresponding slots in the flat perpendicular rods, and by providing the scraper elements, made of rubber or the like, with a cross section which is tapered from the surface downward.

One embodiment of the scraper is shown in Figure 3:

Tabular, graphic, or textual material set at this point is not available. Please consult hard copy or call BNA PLUS at 1-800-452-7773 or 202-452-4323.

The examiner considered that it would have been obvious to closely space the wire rod members of Schulz in view of the Trixner patent. The board affirmed, stating:

It is a matter of notorious knowledge that floor gratings are made with their bars sufficiently close to permit easy walking thereon, such as not to permit woman's narrow heels to be caught therein. In our opinion, the expedient of placing the cross-bars in Fig. 8 of Schulz in close proximity to each other would have been an obvious variant even on the part of persons with less than ordinary skill in the art, particularly in view of Trixner where similar cross members 5 are spaced much closer. The precise spacing is deemed an obvious variant in degree.

* * *

Opinion

Appellant contends that the two references should not be combined because they are from non-analogous arts. Appellant contends that the Patent Office classification of Schulz's patent was in "Roads and Pavements," that the classification of Trixner's patent was under "Brushing, Scrubbing and General Cleaning," and that the skilled in the art "would not expect to find grid or grating structures which are installed in floors under the art 'Brushing, Scrubbing and General Cleaning,'" To this the Solicitor responds:

[A]ppellant is in error in his belief (Br-3) that Schulz is classified in the "Roads and Pavements" art. On the contrary, Schulz is classified with the "Static Structures" art (Class 52), in an area providing for structures having exposed surfaces for increasing friction or reducing wear caused by pedestrian traffic. Also of significance is the fact that the official search notes for this area of Class.52 direct the searcher to Class 15-238, where Trixner is classified, for related art. * *

*

[1] While we find the diverse Patent Office classification of the references to be *some* evidence of "non-analogy," and likewise find the cross-reference in the official search notes to be *some* evidence of "analogy," we consider the similarities and differences in structure and function of the inventions disclosed in the references to carry far greater weight. Cf. *In re Heldt*, 58 CCPA 701, 706-07, 433 F.2d 808, 812, 167 USPQ 676, 679 (1970). Here the structural similarities and the functional overlap between pedestrian gratings and shoe scrapers of type shown by Trixner are readily apparent. We conclude

that, at the very least, the arts to which the Schulz and Trixner patents belong are *reasonably pertinent* to the art with which appellant's invention deals. See *In re Antle*, 58 CCPA 1382, 1387, 444 F.2d 1168, 1171-72, 170 USPQ 285, 287-88 (1971).

Page 528

We have carefully considered appellant's other arguments. However, we are convinced on the record before us that it would have been obvious for one skilled in the art to arrange the wire rod members of Schulz in closer proximity, as shown by Trixner's scraper rods, should it be desired to avoid the catching of women's heels in pedestrian gratings. Accordingly, the decision of the board is *affirmed*.

Footnotes

Footnote 1. Serial No. 618,203, filed February 23, 1967.

Footnote 2. U. S. Patent No. 2,031,007, issued February 18, 1936.

Footnote 3. Austrian Patent No. 175,037, published May 26, 1953.

- End of Case -

Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc.

(CA FC)

230 USPQ 416

Decided July 14, 1986

No. 85-2578

U.S. Court of Appeals Federal Circuit

Headnotes

PATENTS

1. Patentability -- Invention -- In general (§ 51.501)

Federal district court erred by holding laser-marked contact lens patent to be invalid, in view of court's failure to grant patent its statutory presumption of validity, its over-reliance upon inventor's alleged opinion as to non-obviousness, its misuse of such opinion as substitute for determining level of skill of hypothetical person of ordinary skill, its use of improper hindsight analysis, its failure to consider prior art reference in its entirety, and its erroneous reliance upon irrelevant experiments.

2. Infringement -- Tests of -- Comparison with claim (§ 39.803)

Federal district court erred in its finding of non-infringement of contact lens patent, since court, in considering whether accused lenses were "smooth" like patented lenses, did not construe meaning of term "smooth" by resorting to specification, but instead distorted patent's claims by assessing smoothness according to approach that exceeded level of smoothness required in claim.

Particular patents -- Contact Lenses

4,194,814, Fischer, McCandless, and Hager, Transparent Ophthalmic Lens Having Engraved Surface Indicia, holding of invalidity and non-infringement vacated.

Case History and Disposition:

Appeal from District Court for the Northern District of California, Aguilar, J.; 226 USPQ 780 .

Action by Bausch & Lomb, Inc., against Barnes-Hind/Hydrocurve, Inc., and Barnes-Hind International, Inc., for patent infringement, in which defendants counterclaim for declaration of patent invalidity and non-infringement. From judgment for defendants, plaintiff appeals. Vacated and remanded.

Attorneys:

Laurence H. Pretty, and Pretty, Schroeder, Brueggemann & Clark, both of Los Angeles, Calif. (Craig S. Summers, Bernard D. Bogdin, and Howard S. Robbins, all of Rochester, N.Y., on the brief) for appellant.

John M. Calimafde, and Hopgood, Calimafde, Kalil, Blaustein & Judlowe, both of New York, N.Y. (Eugene J. Kalil, Dennis J. Mondolino, and Gilbert W. Rudman, all of Tuckahoe, N.Y., on the brief) for appellees.

Judge:

Before Markey, Chief Judge, Friedman, Circuit Judge, and Nichols, Senior Circuit Judge.

Opinion Text

Opinion By:

Nichols, Senior Circuit Judge.

Appellant Bausch & Lomb, Inc. filed suit in the United States District Court for the North

ern District or California, alleging that appellee Barnes-Hind/Hydrocurve, Inc. and Barnes-Hind International, Inc. (hereinafter Barnes-Hind) infringed patent No. 4,194,814 ('814 patent) in the manufacture and sale of its laser-marked contact lens. Barnes-Hind denied infringement and counterclaimed that the '814 patent was invalid, void, and unenforceable. In No. C-83-20283-RPA, Judge Aguilar found the patent invalid for obviousness and not infringed. We vacate and remand.

Appellee Barnes-Hind relied to a large extent on deposition testimony which was never introduced into evidence. Because this testimony was not in evidence, it would have been improper for us to consider it and, therefore, we did not. This eliminated much of Barnes-Hind's arguments on appeal.

Background

1. The Technology

Vision correcting contact lenses have become familiar; hard contact lenses were introduced in the early 1950's and soft lenses in 1971. Toric contact lenses, which correct for the eye condition known as astigmatism, have a similar history of usage: hard lenses from the early 1950's and soft from the first half of the 1970's. Toric lenses differ from standard contact lenses in having a prism base, *i.e.*, one edge portion of the lens is thicker. Proper prescription and fitting of toric lenses on the cornea of the eye requires alignment of a central lens axis with this prism base. Markings on the contact lens surface greatly facilitate the fitting process.

Inks and other substances have been used since the early 1950's, however, those marking procedures suffer several disadvantages: difficulty of accurate application with possible FDA disapproval; possibility of dissolution, blurring, and allergic reactions. Mechanical marking, as with a sharp scribing tool or an abrading tool such as a dental bur, is also available, but not without its problems: inaccurate and inconsistent positioning of the mark, lens damage, inadequate visibility, and the expense and time involved.

2. The Patent

The '814 patent, entitled Transparent Ophthalmic Lens having Engraved Surface Indicia, discloses an engraved contact lens and provides a method of engraving using a source of high intensity electro-magnetic energy, such as a laser. The mark, not as deep as the lens is thick, is surrounded by a smooth surface of unsublimated or unaffected polymer material with the result that edges of the markings do not inflame or irritate the eyelid of the lens wearer.

The claims in suit are 1, 2, and 7. Claim 1 provides:

An ophthalmic lens adapted to be placed in direct contact with eye tissue formed of a transparent cross-linked polymer material, said lens being characterized by identifying indicia engraved in a surface thereof by subjecting said lens to a beam of radiation emerging from a laser having an intensity and wavelength at least sufficient to sublimate said polymer and form depressions in said lens surface to a depth less than the thickness of said lens, said lens having a smooth surface of unsublimated polymer material surrounding said depressions, and by varying in a predetermined manner the point at which said laser beam impinges upon said lens surfaces to engrave said identifying indicia in said lens surface.

Claim 2 depends from claim 1 with the limitation that the lens is formed by a cross-linked hydrophilic (water loving) polymer. Claim 7, a product claim, is similar to claim 1 but defines the depressions as relieved zones.

3. The Dispute

In February 1976, Mr. Donald Hager, then production manager at the Milton Roy Company, a manufacturer of soft contact lenses which was purchased by appellant Bausch & Lomb in 1979, sent to Carco, Inc., a distributor of laser equipment, six soft contact lenses for laser marking. At least two lenses were successfully marked. Around September 1976, Dr. David Fisher and Mr. James A. McCandless, also of Milton Roy Company, met with Mr. Hager to debrief him on the work. Soon thereafter, Mr. Hager resigned.

Dr. Fisher and Mr. McCandless continued to work on the lens-marking system, and in

November 1977 filed an application for the patent in suit, listing themselves and Mr. Hager as inventors. Mr. Hager declined to execute the patent application, being at that time the employee of another lens manufacturing company, Sauflon International, Inc. and saying that he had not "invented anything in connection with laser marking of contact lens." He further said that he could not execute documents, under oath or otherwise, that represent the contrary. The patent and Trademark Office (PTO) initially, and on a second occasion, rejected all the claims as obvious over two prior art U.S. patents to Brucker (No. 3,833,786) (teaching the use of a laser to fenestrate, i.e., make holes, in contact lens to allow circulation of fluid through the lens) and to Caddell (No. 3,549,733) (disclosing the use of a laser to remove plastic from the surface of a printing plate to form a pattern). The PTO later issued the patent in 1980 as limited to a transparent cross-linked polymer having a smooth surface around the mark. Mr. Hager

Page 418

did sign as inventor in 1982. Meanwhile, Milton Roy commenced manufacture and marketing of laser-marked soft contact lenses in 1978.

Barnes-Hind's predecessor, Continuous Curve, Inc., introduced under the trademark HYDROCURVE a line of soft toric lenses around 1975-76 that were marked with an indentation by a bur. In 1981, Barnes-Hind offered a soft toric lens marked by a laser.

Bausch & Lomb filed suit, contending that certain laser-marked contact lenses manufactured and sold by Barnes-Hind infringe claims 1, 2, and 7 of the '814 patent. Barnes-Hind denied infringement and counterclaimed that the patent was invalid, void, and unenforceable. The parties narrowed the issue of infringement to whether the marks on the HYDROCURVE lenses are surrounded by a smooth surface of unsublimated polymer material with respect to claims 1 and 2 or a smooth and unaffected surface for claim 7.

4. The District Court Proceedings

The district court determined that Barnes-Hind "proved by clear and convincing evidence that the patent in suit (4,194,814) and each of its claims is invalid and therefore void." It concluded that the differences between the claims and the prior art would have been obvious, finding that "the fact that the claimed subject matter of the patent in suit was obvious to Mr. Hager is most indicative of the obviousness of the invention," and that "Dr. Brucker's experiments in laser marking contact lenses are further evidence in support of this court's finding of obviousness." The court further concluded that scanning electron microscope (SEM) photographs, showing "that the surface of these lenses surrounding the laser mark are not 'smooth and unsublimated' or 'unaffected' as those terms were defined by plaintiff [appellant] during the processing of the patent in suit," demonstrated lack of infringement in any case. Bausch & Lomb appealed.

Opinion

The judgment is premised on several legal errors: (1) disregard of the presumption of validity established by 35 U.S.C. § 282; (2) absence of the factual findings on the four inquiries mandated by *Graham v. John Deere Co.*, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966); and (3) improper claim construction leading to the conclusion of noninfringement. We vacate the court's opinion and remand for a determination consistent with this opinion.

1. Presumption of Validity

A patent shall be presumed valid, and each claim shall be presumed valid independently of the validity of other claims. 35 U.S.C. § 282. The burden is on the party asserting invalidity to prove it with facts supported by clear and convincing evidence. *Loctite Corp. v. Ultraseal Ltd.*, 781 F.2d 861, 872, 228 USPQ 90, 97 (Fed. Cir. 1985); *Jones v. Hardy*, 727 F.2d 1524, 220 USPQ 1021 (Fed. Cir. 1984).

The record contains no reference to this statutory presumption of validity, nor does it appear that the district court considered separately the validity of the three claims at issue. By merely holding that "defendants have proved by clear and convincing evidence that the patent in suit (4,194,814) and each of its claims is invalid and therefore void," the district court improperly denied the '814 patent its statutory presumption of validity as to each claim.

The district court thought the examiner had been misled. Barnes-Hind argued and argues here that Bausch & Lomb (or rather its later acquired company Milton Roy) misled the examiner during prosecution. Appellees assert that "if the examiner had been correctly and forthrightly informed of Hager's and McCandless' opinions, the chemistry of the Brucker lens, and the teaching of the Caddell patent, he would not have issued the patent." The record, however, does not support this assertion.

The examiner did know of Hager's temporary refusal to execute the application during prosecution and, as discussed more fully *infra*, a determination of nonobviousness is based, *inter alia*, on the opinion of a hypothetical person of ordinary skill in the art, not on the inventors' opinion. The weight to be attached to Hager's refusal cannot be exaggerated as the court below has done without clear error in view of Hager's self interest as an employee of a competitor and his later change of position. Instances of inventors refusing even to cooperate in obtaining issuance of a patent to be owned by an assignee are common and machinery is provided in 37 C.F.R. § 1.47 to deal with them. Section 1.47 provides that either a joint inventor or a proper assignee may file the application without the consent or signature of the inventor, just so the oath or declaration is accompanied by a petition including proof of pertinent facts. It is clear, therefore, that the PTO does not allow the inventor to erect that type of obstacle to obtaining patent protection. Such forethought is necessary, as otherwise an inventor's changed self interest might nullify a proper assignment. The district court's heavy reliance on Mr. Hager's assertions, if persisted in, would allow a co-inventor another chance at sabotage if the first effort has failed.

Finally, the examiner, who with the deference we owe governmental officials we assume has some expertise in interpreting the refer

Page 419

ences and some familiarity with the level of skill in the art, *American Hoist & Derrick Co. v. Sowa & Sons, Inc.*, 725 F.2d 1350, 1359, 220 USPQ 763, 770 (Fed. Cir.), *cert. denied*, ___ U.S. ___, 105 S.Ct. 95, 224 USPQ 520 (1984), did have the Brucker and Caddell patents before him. Barnes-Hind's "misleading the examiner" contention is insufficiently supported to overcome the presumption of validity.

As a final matter, we recognize, as the district court did not, that when the prior art before the court is the same as that before the PTO, the burden on the party asserting invalidity is more difficult to meet. *American Hoist*, 725 F.2d at 1359, 220 USPQ at 770.

2. *Graham Findings*

Obviousness under 35 U.S.C. § 103 is a question of law based on the underlying factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966): (1) the scope and content of the prior art; (2) the differences between the prior art and the claims at issue; (3) the level of ordinary skill in the art; and (4) objective evidence of secondary considerations. *See, e.g., Loctite*, 781 F.2d at 872, 228 USPQ at 97-98.

The *Loctite* court further stated:

In patent cases, the need for express *Graham* findings takes on an especially significant role because of an occasional tendency of district courts to depart from the *Graham* test, and from the statutory standard of obviousness that it helps determine, to the tempting but forbidden zone of hindsight. Thus we must be convinced from the opinion that the district court actually applied *Graham* and must be presented with enough express and necessarily implied findings to know the basis of the trial court's opinion.

Id., 228 USPQ at 98.

Here, as in *Loctite* and in *Jones*, we are not convinced that the district court applied the *Graham* findings. Instead, it found Mr. Hager's opinion that the subject matter was obvious "most indicative of the obviousness of the invention." This was legal error.

Unlike the district court, we have the benefit of the very clear exposition of the law in *Standard Oil Co. v. American Cyanamid Co.*, 774 F.2d 448, 454, 227 USPQ 293, 297-98 (Fed. Cir. 1985):

The issue of obviousness is determined entirely with reference to a *hypothetical* "person having ordinary skill in the art." It is only that hypothetical person who is presumed to be aware of all the pertinent art. The actual inventor's skill is irrelevant to this inquiry, and this is for a very important reason. The statutory emphasis is on a person of *ordinary* skill. Inventors, as a class, according to the concepts underlying the Constitution and the statutes that have created the patent system, possess something -- call it what you will -- which sets them apart from the workers of *ordinary* skill, and one should not go about determining obviousness under § 103 by inquiring into what *patentees* (i.e., inventors) would have known or would likely have done, faced with the revelation of references. [Emphasis in original.]

[1] In this regard then, the district court erred at least three times: it relied too heavily on the alleged opinion of one who was an inventor and patentee, and misused that opinion as a substitute for determining the level of skill of the hypothetical person of ordinary skill and what that person would have been able to do when in possession of the prior art, the scope and contents of which the court should also have determined.

The court also engaged in improper hindsight analysis to conclude the '814 patent would have been obvious. The court essentially adopted Barnes-Hind's argument that "the concept of forming ridgeless depressions having smooth rounded edges using a laser beam to vaporize the material is explicitly disclosed in the Caddell patent. *This is exactly the same process claimed in the patent-in-suit and practiced by the plaintiff.*"

Barnes-Hind selected a single line out of the Caddell specification to support the above assertion: "one way in which this [forming ridgeless depressions] can be achieved is to use a laser with high enough intensity to vaporize the plate material without melting

it." Col. 5, lines 53-54. This statement, however, was improperly taken out of context. As the former Court of Customs and Patent Appeals held:

It is impermissible within the framework of section 103 to pick and choose from any one reference only so much of it as will support a given position to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one skilled in the art.

In re Wesslau, 353 F.2d 238, 241, 147 USPQ 391, 393 (CCPA 1965); *see also In re Mercer*, 515 F.2d 1161, 1165-66, 185 USPQ 774, 778 (CCPA 1975).

A full appreciation of Caddell's statement requires consideration of the immediately following sentences in the same paragraph and the paragraph after that. Viewed in that context, it is apparent that Caddell's ideal printing plate would have no ridges around the depression. The use of a high intensity laser is offered as a possible means to achieve the goal but is limited by several disadvantages. To overcome these disadvantages, Caddell suggests the use of a special class of polymer that forms ridgeless depressions. A complete read

Page 420

ing demonstrates quite clearly that Caddell is setting up a strawman and pointing out its disadvantages to highlight the advantages of Caddell's invention, that special class of polymers. The district court improperly viewed an isolated line in Caddell in light of the teaching of the '814 patent to hold for obviousness. This is improper hindsight analysis.

The district court also failed to consider the Caddell reference in its entirety and thereby ignored those portions of the reference that argued against obviousness. *W. L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1550, 220 USPQ 303, 311 (Fed. Cir. 1983), *cert. denied*, ___ U.S. ___, 105 S. Ct. 172 (1984). Caddell compared the ridge formation of his special class of polymers against, *inter alia*, Lucite, a copolymer composed of ethyl acrylate with methylmethacrylate -- very similar to the chemical referred to in the '814 patent -- and found that *only* his special class formed depressions without ridges. Thus, Caddell actually taught away from laser etching of soft contact lenses.

As further evidence of obviousness, the district court relied on Dr. Brucker's experiments in laser marking contact lenses. This too was error, in this case clearly erroneous factual error. The record does not support, indeed it contradicts, the supposition that Dr. Brucker had engaged in laser marking of soft contact lenses at the time of the present invention. On page 385 of the Appendix, in reply to Mr. Calimafde's question "when did Continuous Curve begin to experiment with laser marking of soft contact lenses?", Dr. Brucker replied "I believe it was in '79 -- '79, '80, somewhere in that area." The filing date of the '814 patent was November 10, 1977. Brucker's 3,833,786 patent for a method of fenestrating (putting windows in) contact lenses applies according to its claims to such lenses, both soft and hard. However, the record reflects that the need for such fenestration was as a mode of escape for fluid accumulating between the lens and the eye. Such a need does not exist respecting the soft lenses, the principal subject of the claims in suit, of which claim 2 is expressly limited to soft lenses. They, being hydrophilic, absorb the fluid.

In sum, the district court improperly determined the '814 patent was obvious: it failed to make the Graham inquiries, it improperly focused on what was obvious to the inventor,

it engaged in hindsight analysis, and it considered evidence that was not prior art. This court, as an appellate court, may not make the required Graham factual findings, and must therefore remand that determination to the district court. The district court should not ignore the four-part analysis the authorities require.

a. The scope and content of prior art

To determine whether a reference is within the scope and content of the prior art, first determine if the reference is within the field of the inventor's endeavor. If it is not, then next consider whether the reference is reasonably pertinent to the particular problem with which the inventor was involved. *In re Richard M. Deminski*, 230 USPQ 313, 315, No. 85-2267, slip op. at 9 (Fed. Cir. July 8, 1986); *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1535, 218 USPQ 871, 876 (Fed. Cir. 1983). *Orthopedic Equipment Co., Inc. v. United States*, 702 F.2d 1005, 1008-11, 217 USPQ 193, 196-97 (Fed. Cir. 1983) focused on the claims in suit, the art the PTO applied to the claims, and the nature of the problem confronting the inventor. Further, the art must have existed as of the date of invention, presumed to be the filing date of the application until an earlier date is proved.

b. The differences between the claimed invention and the prior art

The court must view the claimed invention as a whole. See, e.g., *Jones*, 727 F.2d at 1527-28, 220 USPQ at 1024. We add, as a cautionary note, that the district court appeared to distill the invention down to a "gist" or "core," a superficial mode of analysis that disregards elements of the whole. It disregarded express claim limitations that the product be an ophthalmic lens formed of a transparent, cross-linked polymer and that the laser marks be surrounded by a smooth surface of unsublimated polymer. See also, *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 221 USPQ 929 (Fed. Cir. 1984).

c. Level of ordinary skill in the art

In *Environmental Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 697, 218 USPQ 865, 868-69 (Fed. Cir. 1983), cert. denied, 464 U.S. 1043 (1984), the court listed six factors relevant to a determination of the level of ordinary skill: educational level of the inventor, type of problems encountered in the art, prior art solutions, rapidity of innovation, sophistication of technology, and educational level of active workers in the field. As to educational level of the inventor, see *Standard Oil Co. v. American Cyanamid Co.*, 774 F.2d 448, 227 USPQ 293 (Fed. Cir. 1985); *Orthopedic Equipment Co. v. All Orthopedic Appliances*, 707 F.2d 1376, 1382, 217 USPQ 1281, 1285 (Fed. Cir. 1983) ("Although the educational level of the inventor may be a factor in determining the level of ordinary skill in the art, it is by no means conclusive.")

d. Objective indicia of obviousness

Such "secondary considerations," when present, must always be considered. *Stratoflex*, 713 F.2d at 1538, 218 USPQ at 878-79. See also *Cable Electric Products, Inc. v. Genmark*,

Inc., 770 F.2d 1015, 1026-28, 226 USPQ 881, 887-88 (Fed. Cir. 1985). Such evidence includes commercial success, long felt but unresolved needs, and failed attempts. *Perkin-Elmer Corp. v. Computervision Corp.*, 732 F.2d 888, 895-96, 221 USPQ 669, 675 (Fed.

Cir.), *cert. denied*, ___ U.S. ___, 105 S.Ct. 187, 225 USPQ 792 (1984).

We shall vacate the trial court's opinion and remand for an obviousness determination consistent with this opinion.

3. Infringement

The parties narrowed the infringement issue for trial to the question whether the surface of Barnes-Hind lenses surrounding the laser mark is "smooth and unsublimated" or "unaffected." The district court concluded that "the laser-engraved depressions in the surface of the HYDROCURVE II lenses have been examined by scanning electron microscope. These photographs show that the surface of these lenses surrounding the laser mark are not 'smooth and unsublimated' or 'unaffected' as those terms were defined by plaintiff during the prosecution of the patent in suit." Appellant Bausch & Lomb argues on appeal that the trial court's approach of assessing smoothness at the very high levels of magnification obtainable by a SEM exceeds the level of smoothness required in the claims. We agree.

Because the first step in determining infringement is claim construction, improper claim construction can distort the entire infringement analysis. *Moeller v. Lonetics, Inc.*, 229 USPQ 992, 994, No. 85-2646, slip op. at 7 (Fed. Cir. June 4, 1985). Such a distortion occurred below.

Disputed issues such as the meaning of the term "smooth," should be construed by resort to extrinsic evidence such as the specification, other claims, and the prosecution history. Here, resort to the specification clearly demonstrates that "smooth" meant that "the edges of the craters neither inflame nor irritate the eyelid of the lens wearer * * *." The markings provided on the lens surface in accordance with this invention * * * are not perceived by the lens wearer * * *." The prosecution history supports this construction. A reading of the amendment and its accompanying remarks demonstrates that smooth means the absence of a ridge that "would scratch either the eye or eyelid and would lead to infection." There is no indication that smooth means absolutely ridge-free. (This review of the prosecution history also leads us to disagree with Barnes-Hind's final argument that the prosecution history estops Bausch & Lomb from asserting infringement against the allegedly ridged HYDROCURVE lens.) Testimony from Dr. Mandell, Bausch & Lomb's expert in the field of contact lenses, indicates that to a person of ordinary skill in the art, smooth would mean an absence of "roughness or significant elevation" so that a wearer "would not feel it with the [eye]lid." Further, there is testimony that a person of ordinary skill in the art would use an optical microscope, not an SEM, to gauge the relative smoothness of an etched contact lens.

[2] We hold that smooth means smooth enough to serve the inventor's purposes, *i.e.*, not to inflame or irritate the eyelid of the wearer or be perceived by him at all when in place. Accordingly, we vacate the district court's conclusion that the surface of the HYDROCURVE lenses are not smooth or unaffected, and remand for a determination of infringement based on the proper construction of and proper test for smooth.

Conclusion

We vacate the district court's determination that the '814 patent is invalid and remand for a reconsideration of validity in light of the presumption of validity and the *Graham* findings on obviousness. We further vacate the decision of noninfringement and remand for proper claim construction and infringement analysis.

VACATED AND REMANDED

FULL TEXT OF CASES (USPQ2D)

All Other Cases

In re Gorman (CA FC) 18 USPQ2d 1885 In re

Gorman

U.S. Court of Appeals Federal Circuit
18 USPQ2d 1885**Decided May 13, 1991****No. 90-1362****Headnotes****PATENTS****1. Patentability/Validity - Obviousness - Combining references (§ 115.0905)**

Patent and Trademark Office's reliance on teachings of large number of references in rejecting patent application for obviousness does not, without more, weigh against holding of obviousness on appeal, since criterion is not number of references, but whether references are in fields which are same as or analogous to field of invention, and whether their teachings would, taken as whole, have made invention obvious to person skilled in that field.

2. Patentability/Validity - Construction of claims (§ 115.03)**Patentability/Validity - Obviousness - In general (§ 115.0901)**

Claim which describes features of invention in great detail is nevertheless obvious in view of prior art, since claim that is narrowly and specifically drawn must still meet requirements of 35-USC-103, and details listed in claim are shown in references and thus do not contribute to unobviousness.

3. Patentability/Validity - Obviousness - Relevant prior art - Particular inventions (§ 115.0903.03)**Patentability/Validity - Obviousness - Combining references (§ 115.0905)**

Application claim for candy sucker on stick, molded in elastomeric mold in shape of human thumb, is obvious in view of prior art, since all elements of claim, including molded lollipop having chewing gum base plug, with elastomeric mold serving as product wrapper, and candy in shape of human thumb, are shown in prior art references in various subcombinations, used in same manner and for same purpose as in claimed invention.

Case History and Disposition:

Page 1886

Appeal from the U.S. Patent and Trademark Office, Board of Patent Appeals and Interferences.

Patent application of Jeffrey B. Gorman and Marilyn Katz, serial no. 06/882,480 (composite food product). From decision of Board of Patent Appeals and Interferences upholding examiner's rejection of all claims in application, applicants appeal. Affirmed.

Attorneys:

Thomas W. Tolpin, Highland Park, Ill., for appellant.

Teddy S. Gron, associate solicitor (Fred E. McKelvey, solicitor, with him on brief), for appellee.

Judge:

Before Rich, Newman, and Rader, circuit judges.

Opinion Text**Opinion By:**

Newman, J.

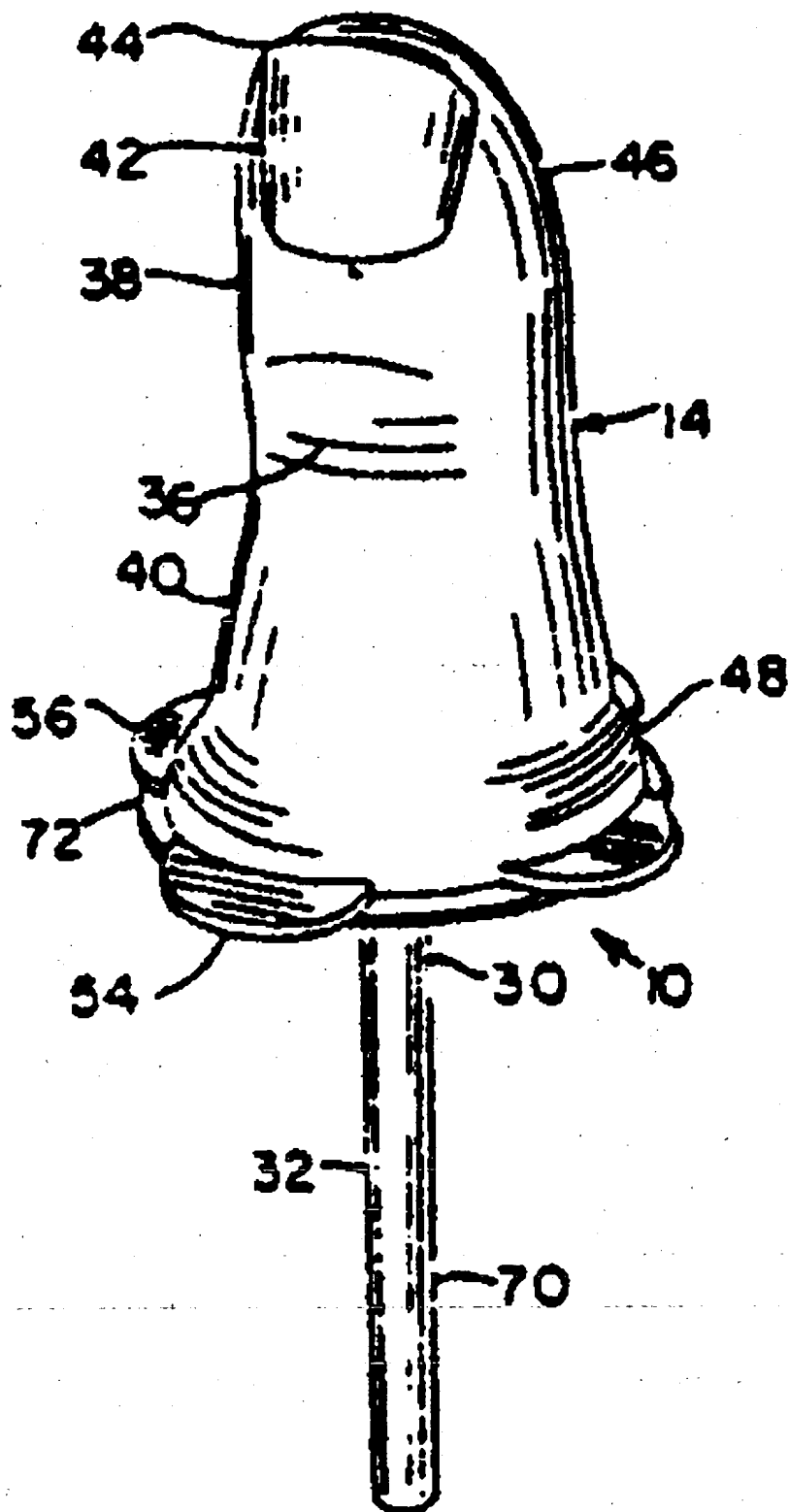
Jeffrey B. Gorman and Marilyn Katz (hereinafter "Gorman") appeal the decision of the United States Patent and Trademark Office, Board of Patent Appeals and Interferences (the "Board") denying patentability to all the claims of Gorman's patent application Serial No. 06/882,480, entitled "Composite Food Product." We affirm.

The Invention

The claimed invention is a composite candy sucker on a stick, molded in an elastomeric mold in the shape of a human thumb. During the manufacturing process liquid candy is poured into the mold, and an edible plug of bubble or chewing gum or chocolate or food-grade wax is poured into the mold after the candy has hardened, serving as a seal for the end portion of the candy. A paper or plastic disc abuts and covers the plug. The mold serves as a cover that can be removed from the candy by means of protruding flanges. The cover is described as a "toy and novelty item".

Figure 1 shows the invention in the form in which it is marketed. Figure 2 shows the cover partially removed to reveal the candy portion (12) and the chewable or edible plug (58):

FIG. 1



46



The claims describe the product in detail, as is apparent from claim 16, the claim pressed by Gorman in this appeal:

16. A composite food product, comprising:
a candy core, said candy core being in a generally liquified form when formulated,

Page 1887

heated, blended and poured into a mold and in a substantially thumb-shaped hardened form when cooled and removed from said mold;
said thumb-shaped hardened form comprising said candy core positioned along a vertical axis and comprising a rigid joint-shaped portion, a rigid upper portion extending upwardly from said rigid joint-shaped portion along said vertical axis, and a rigid lower portion extending downwardly from said rigid joint-shaped portion along said vertical axis, said upper portion having a rigid finger nail-shaped portion with an upper rigid tip providing a rigid top end of said thumb-shaped hardened form and a rigid convex back extending rearwardly and downwardly from said rigid tip, and said rigid lower portion having a rigid bottom end and defining a recessed opening comprising a handle-receiving socket about said vertical axis;

a removable resilient shell comprising a substantially thumb-shaped, elastomeric material selected from the group consisting of rubber and flexible plastic, said shell providing a mold for receiving and molding said liquified candy form,

a removable outer protective cover positioned about and covering said hardened form comprising said candy core, and

a toy and novelty item for placement upon the thumb of the user when removed from said hardened form comprising said candy core;

said thumb-shaped elastomeric material comprising said removable resilient shell comprising a flexible joint-shaped portion, a flexible upper portion extending upwardly from said flexible joint-shaped portion along said vertical axis, and a flexible lower portion extending downwardly from said flexible joint-shaped portion along said vertical axis, said upper portion having a flexible finger nail-shaped portion with an upper flexible tip providing a flexible top end of said shell and a flexible convex back extending rearwardly and downwardly from said flexible tip, and said flexible lower portion having an enlarged open ended diverging base, said base having a larger circumference and transverse cross-sectional area than other portions of said shell and providing the bottom of said shell, said open ended base defining a plug-receiving chamber and an access opening for entrance of said liquified form and discharge of said hardened candy form, and a set of substantially symmetrical arcuate lobes extending radially outwardly from said base, said lobes being circumferentially spaced from each other and providing manually grippable flange portions to facilitate manual removal of said shell from said core;

a plug positioned in said plug-receiving chamber adjacent said bottom of said shell, said plug abutting against the bottom of said core and providing a cap for substantially plugging and sealing the open end of said mold and cover to help enclose said candy core; and said plug comprising a food grade material selected from the group consisting of bubble gum, chewing gum, chocolate, and food-grade wax;

a handle having a connecting portion connected to said plug and said candy core and positioned in said plug-receiving opening and having a manually grippable handle

portion extending downward from said connecting portion along said vertical axis; and a substantially planar annular disk for abuttingly engaging and removably seating against said base and said lobes adjacent said plug, said disk defining a central axial hole for slidably receiving said handle portion and having an outer edge with a maximum span larger than said access opening but less than the maximum diameter of said symmetrical set of lobes to substantially minimize the interference with manually gripping of said manual grippable flange portions of said lobes, said disk being of a material selected from the group consisting of paper, paperboard, and plastic, and providing a removable closure member and seal for substantially closing said access opening and sealing said plug and said candy core within said shell.

The claims were rejected in view of thirteen references. The primary references, patents to Siciliano, Copeman, and Pooler, show ice cream or candy molded in a plastic, rubber or elastomeric mold. In Siciliano and Copeman the mold also serves as the product wrapper. In Siciliano the ice cream is poured into the mold, a stick is inserted, the ice cream is hardened, and a cardboard cover seals the area between the stick and the elastomeric wrapper. Copeman and Kuhlke show candy lollipops molded in elastomeric molds. Copeman states that the mold may take "varying shapes, such as in the form of fruit, or animals" and Kuhlke discusses the desirability of sealing candy from the outside air. In Siciliano, Copeman and Kuhlke, the mold is peeled from the confection prior to use.

The two Nolte patents teach that gripping flanges may be placed on an ice cream wrap

Page 1888

per to facilitate removal. Ahern and Knaust each show a disc-shaped seal or cover for a frozen confection. Ahern shows the cover in conjunction with ice cream on a stick. Harris shows a hollow thumb-shaped lollipop into which the thumb is inserted, and Craddock shows a thumb-shaped confection supported on a disc-shaped handle; in both cases without the other elements shown by Gorman. Fulkerson shows a candy coating surrounding a block of ice cream, and a candy plug for retaining liquid syrup inside a cavity in the ice cream. Webster shows chewing gum entirely enclosing a liquid syrup product. Spiegel shows a chocolate layer having an alcohol diffusion barrier to plug the end of a plastic container of liqueur. Fulkerson, Webster and Spiegel all suggest the greater appeal to consumers of providing two different components in the same confection.

The Board found that all of the features of Gorman's product were known to the art, and that various combinations of these elements existed in known similar structures. The Board concluded that the applicant's claimed combination was suggested by and would have been obvious in light of the references.

Discussion

A

Each element of the Gorman claims is in the prior art, separately or in sub-combination. Gorman argues that when it is necessary to combine the teachings of a large number of references in order to support a rejection for obviousness under 35 U.S.C. § 103, this of itself weighs against a holding of obviousness.

[1] The criterion, however, is not the number of references, but what they would have

meant to a person of ordinary skill in the field of the invention. In *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1383, 231 USPQ 81, 93 (Fed. Cir. 1986), cert. denied, 480 U.S. 947 (1987), the court held that a combination of about twenty references that "skirt[ed] all around" the claimed invention did not show obviousness. In other instances, on other facts, we have upheld reliance on a large number of references to show obviousness. Compare *In re Miller*, 159 F.2d 756, 758-58, 72 USPQ 512, 514-15 (CCPA 1947) (rejecting argument that the need for eight references for rejection supported patentability) with *Kansas Jack, Inc. v. Kuhn*, 719 F.2d 1144, 1149, 219 USPQ 857, 860 (Fed. Cir. 1983) (where teachings relied upon to show obviousness were repeated in a number of references, the conclusion of obviousness was strengthened). See also, e.g., *In re Troiel*, 274 F.2d 944, 947, 124 USPQ 502, 504 (CCPA 1960) (rejecting appellant's argument that combining a large number of references to show obviousness was "farfetched and illogical").

Determination of whether a new combination of known elements would have been obvious to one of ordinary skill depends on various facts, including whether the elements exist in "analogous art", that is, art that is reasonably pertinent to the problem with which the inventor is concerned. *In re Deminski*, 796 F.2d 436, 442, 230 USPQ 313, 315 (Fed. Cir. 1986). When the references are all in the same or analogous fields, knowledge thereof by the hypothetical person of ordinary skill is presumed, *In re Sernaker*, 702 F.2d 989, 994, 217 USPQ 1, 5 (Fed. Cir. 1983), and the test is whether the teachings of the prior art, taken as a whole, would have made obvious the claimed invention. See *In re Young*, 927 F.2d 588, 591, 18 USPQ2d 1089, 1091 (Fed. Cir. 1991).

When it is necessary to select elements of various teachings in order to form the claimed invention, we ascertain whether there is any suggestion or motivation in the prior art to make the selection made by the applicant. *Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 1143, 227 USPQ 543, 551 (Fed. Cir. 1985). "Obviousness can not be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the combination." *In re Bond*, 910 F.2d 831, 834, 15 USPQ2d 1566, 1568 (Fed. Cir. 1990) (quoting *Carella v. Starlight Archery and Pro Line Co.*, 804 F.2d 135, 140, 231 USPQ 644, 647 (Fed. Cir. 1986)).

The extent to which such suggestion must be explicit in, or may be fairly inferred from, the references, is decided on the facts of each case, in light of the prior art and its relationship to the applicant's invention. As in all determinations under 35 U.S.C. §103, the decisionmaker must bring judgment to bear. It is impermissible, however, simply to engage in a hindsight reconstruction of the claimed invention, using the applicant's structure as a template and selecting elements from references to fill the gaps.

Interconnect Planning, 774 F.2d at 1143, 227 USPQ at 551. The references themselves must provide some teaching whereby the applicant's combination would have been obvious.

Page 1889

B

Gorman argues that the references showing ice cream in a mold or wrapper on a stick and the references showing candy in a mold or wrapper on a stick are not analogous, for they require different conditions of production. However, the Copeman reference shows the

close relationship of these arts, stating that his elastomeric mold may be used for "frozen confections and other solid confections". We conclude that the ice cream on a stick and candy on a stick arts are analogous, and that the Siciliano, Copeman, Pooler, and Kuhlke references show or suggest Gorman's candy on a stick and covered with an elastomeric mold, for which the thumb-shape is shown by Harris or Craddock.

The suggestion of providing a layer of chewing gum, chocolate or the like, surrounding the candy core in the area not covered by the mold, to seal the candy and provide a second food product, is provided by Fulkerson, Webster, or Spiegel. The paper disc adjacent the base of the candy structure is shown in Ahern and Knaust. Harris and Craddock both show thumb-shaped candy. Gorman argues that the prior art does not suggest using the thumb-shaped cover as a toy after the candy is removed. However, Copeman states that his rubber mold may be used as a "toy balloon" after the candy is removed. Gorman argues that Craddock teaches away from the claimed invention because of Craddock's admonition that lollipops on sticks are dangerous to children. However, candy on a stick is too well known for this caution to contribute to unobviousness.

[2] Claim 16 recites details such as a "joint-shaped portion", a "finger nail portion", an "upper portion", a "lower portion" and a "convex back", as descriptive of the thumb shape. Such details are shown in the references and do not contribute to unobviousness. A claim that is narrowly and specifically drawn must nevertheless meet the requirements of §103:

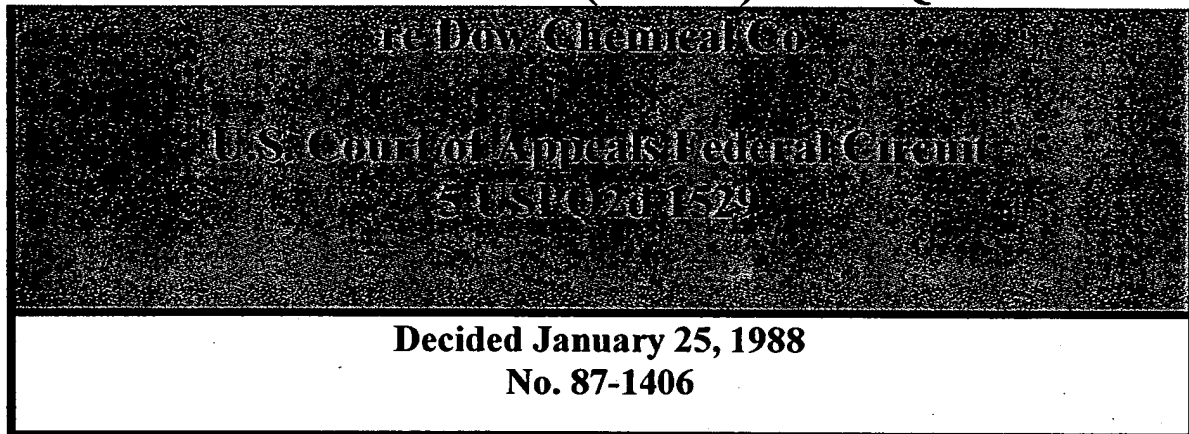
The mere fact that a claim recites in detail all of the features of an invention (i.e., is a "picture claim") is never, in itself, justification for the allowance of such a claim.

Manual of Patent Examining Procedure, §706 (Rev. 6, Oct. 1987) at p. 700-6; *In re Romito*, 289 F.2d 518, 129 USPQ 359 (CCPA 1961) (rejecting a "picture claim").

[3] Applying the principles of *Graham v. John Deere & Co.*, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), we discern all of the elements of claim 16, used in substantially the same manner, in devices in the same field of endeavor. The various elements Gorman combined: the molded lollipop with a chewing gum plug, with the mold serving as the product wrapper; and candy in the shape of a thumb; are all shown in the cited references in various sub-combinations, used in the same way, for the same purpose as in the claimed invention. The Board did not, as Gorman argues, pick and choose among isolated and inapplicable disclosures in the prior art. Rather, the claim elements appear in the prior art in the same configurations, serving the same functions, to achieve the results suggested in prior art. *In re Sernaker*, 702 F.2d at 994, 217 USPQ at 5. The large number of cited references does not negate the obviousness of the combination, for the prior art uses the various elements for the same purposes as they are used by appellants, making the claimed invention as a whole obvious in terms of 35 U.S.C. §103.

The Board's decision is *AFFIRMED*.

- End of Case -

FULL TEXT OF CASES (USPQ2D)
All Other Cases**In re Dow Chemical Co. (CA FC) 5 USPQ2d 1529 In****Headnotes****PATENTS****1. Patentability/validity -- Obviousness -- Evidence of (§ 115.0903)**

Patentability/validity -- Obviousness -- Secondary considerations (§ 115.0907)
Board of Patent Appeals and Interferences erred in rejecting as obvious claims for invention of impact resistant rubber-based resin suitable for molding and extrusion containing preferred ingredients styrene, maleic anhydride, and synthetic diene rubbers, since none of prior art references cited by patent holder and PTO suggest that any process could be used successfully in such three-component system to produce resin having desired properties, and since board did not give fair evidentiary weight to expert's skepticism concerning invention, or to five to six years necessary to produce invention, in determining obviousness issue.

Particular Patents -- Chemical -- Rubber Based Resins
3,919,354, Moore, Lehrer, Lyons and McKeever, impact resistant polymers of a resinous copolymer of an alkenyl aromatic monomer and unsaturated dicarboxylic anhydride, holding of obviousness reversed.

Case History and Disposition:

Page 1529

Appeal from the U.S. Patent and Trademark Office Board of Patent Appeals and Interferences.

Reexamination of Patent No. 3,919,354, held by The Dow Chemical Company. From decisions rejecting all claims of patent as obvious, patent holder appeals. Reversed.

Attorneys:

Douglas N. Deline, Midland, Mich. (Berndt W. Sandt with him on the brief) for appellant.

John H. Raubitschek, associate solicitor, Arlington, Va. (Joseph F. Nakamura, solicitor, and Fred E. McKelvey, deputy solicitor, with him on the brief) for appellee.

Judge:

Before Smith, Nies, and Newman, Circuit Judges.

Opinion Text**Opinion By:**

Newman, Circuit Judge.

Dow Chemical Company appeals the decisions of the United States Patent and Trademark Office Board of Patent Appeals and Interferences, No. 86-3426 (Feb. 25, 1987) and No. 662-81 (Mar. 25, 1986), together rejecting all the claims on reexamination of United States Patent No. 3,919,354 entitled "Impact Resistant Polymers of a Resinous Copolymer of an Alkenyl Aromatic Monomer and an Unsaturated Dicarboxylic Anhydride." We reverse.

The Rejection

The invention is an impact resistant rubber-based resin having improved resistance to heat distortion. Claim 28, the broadest claim on appeal, is illustrative:

28. A polymer suitable for molding and extrusion, of substantially improved resistance to mechanical shock and impact, the polymer consisting essentially of the polymerization product of

a. a monovinyl alkenyl aromatic monomer containing up to 12 carbon atoms and having the alkenyl group attached directly to the benzene nucleus, the al

Page 1530

kenyl aromatic compound being present in a proportion of from about 65 to 95 parts by weight and from 35 to 5 parts by weight of an unsaturated dicarboxylic acid anhydride readily copolymerizable therewith, and

b. from 5 to 35 parts by weight of a diene rubber per 100 parts of (a) plus (b), the rubber consisting essentially of 65 to 100 weight percent butadiene, or isoprene and up to 35 weight percent of an alkenyl aromatic hydrocarbon as the sole other monomer in the rubber, the rubber having a glass temperature not higher than 0° C., the rubber being in the form of a plurality of particles having diameters within the range of 0.02 to 30 microns dispersed throughout a matrix of polymer of alkenyl aromatic monomer and the anhydride, at least a major portion of the rubber particles containing distinct occlusions of the polymer of (a), with the further limitation that the polymer of (a) is a nonequimolar random copolymer.

The preferred ingredients are styrene, maleic anhydride, and synthetic diene rubbers, and our discussion will be in these terms, as was the Board's.

The Board's decision that the claimed invention would have been obvious in terms of 35 U.S.C. §103 was based on the combination of two references: a 1966 article by Molau and Keskkula entitled "Heterogeneous Polymer Systems IV. Mechanism of Rubber Particle Formation in Rubber-Modified Vinyl Polymers", and Baer U.S. Patent No. 2,971,939. Also discussed were Farmer U.S. Patent No. 2,275,951 and a publication by Bacon and Farmer entitled "The Interaction of Maleic Anhydride with Rubber", although the Board stated that the rejection was sustainable without relying on either of these references.

The Prior Art

The Molau/Keskkula article shows the preparation of a resin having high impact strength by dissolving synthetic diene rubber in styrene and polymerizing the styrene. This reference teaches that phase inversion is necessary to the formation of these moldable, extrudable resins. Baer prepares nonequimolar random maleic anhydride-styrene copolymers by a technique whose salient feature is adding the maleic anhydride slowly to polymerizing styrene under controlled conditions.

Farmer shows the reaction among natural rubber, styrene, and maleic anhydride, and also states that maleic anhydride reacts directly with the rubber. The Bacon and Farmer article also shows the reaction of maleic anhydride with natural rubber. These products, according to Dow's evidence and as found by the Board, do not have a dispersed rubber phase containing occlusions, and are not moldable.

Dow argues that the Board has engaged in hindsight reconstruction of the claimed invention. To support its position Dow refers to several scientific publications and other references, in addition to those cited by the PTO, and evidence submitted by declaration and deposition.

The first group of references to which Dow refers shows the reaction of maleic anhydride with natural or synthetic rubbers. These references show both intermolecular and intramolecular reactions between maleic anhydride and the various rubbers, but not a grafted rubber, which is said by Dow to characterize its product. Additional references are cited by Dow to show that maleic anhydride is much more reactive with diene-type synthetic rubbers than with natural rubber, and that the reaction with the synthetic rubbers is difficult to control and the product is unpredictable.

Another reference cited by Dow, the *Encyclopedia of Science and Technology*, states the general rule, derived from experience with acrylonitrile, that copolymers with synthetic diene rubbers have elevated glass transition temperatures; Dow advises that this is a highly undesirable property for a high-impact strength resin.

Another series of references cited by Dow shows several known techniques of reacting styrene and maleic anhydride to prepare nonequimolar copolymers, all different from the technique shown in the Baer patent.

Analysis

The Board held that the claimed product results from the application of the Baer technique to a styrene-maleic anhydride polymer system which includes synthetic diene rubber, and that it would have been obvious to do that which these inventors did if one wanted to increase the heat stability of a known high impact styrene rubber resin.

The crux of Dow's argument is that no reference shows or suggests that these references should or could be combined successfully. Indeed, the Board agreed, stating that "[i]t is not apparent from the evidence whether rubber and maleic anhydride would have been expected to react *in the process suggested by the combined disclosure of Molau and Baer . . .*" (Emphasis in original).

Page 1531

Dow also points out, referring to the Keskkula evidence, that it was believed that these products could not be made by the mass polymerization techniques of the prior art. Dow asserts that no reference, including Baer, suggested that the Baer technique could produce the requisite phase inversion in a system containing diene rubber, and could produce a diene-rubber containing resin that could be molded and had the other desired high-impact and thermal properties.

Dow refers to the Farmer patent, cited by the examiner and the Board, which shows that the reaction of styrene, maleic anhydride, and natural rubber forms a product that is unsuitable as a molding resin. Dow argues that Farmer leads away from the Dow invention, in that Farmer obtains precisely the "runaway" reaction, and undesirable product, that Keskkula believed was characteristic of reactions involving styrene, maleic anhydride, and rubbers. Dow points to Dr. Keskkula's Report to Dow management, written in 1966 at about the time the present invention was made, pointing out the many problems in attempting to produce the three-component product that these inventors later succeeded in producing.

In response, the Commissioner argues that even though an expert polymer scientist, Dr. Keskkula, "personally may have been surprised by the invention at the time it was made, it does not necessarily follow that the invention would have been unobvious to one of ordinary skill in the art." The Commissioner suggests that one less encumbered by knowledge of the need for phase inversion, as described in the Molau/Keskkula article, might have achieved the Dow product by combining the references in the way suggested by the Commissioner. Reflecting on this theory of invention, we observe that such a person did not do so, despite the decades of experimentation with these components, and the recognition of need, as evidenced by the many references cited by both sides. —See *In re Geiger*, 815 F.2d 686, 688, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987); *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed.

Cir. 1984).

The Board held that Dow's statement in the patent specification that it was known that styrene/maleic anhydride copolymers had improved heat resistance as compared with styrene rubbers, made it prima facie obvious to combine these three components. Indeed, the record shows that such combinations had previously been made, in various ways, but without producing the product here desired. That there were other attempts, and various combinations and procedures tried in the past, does not render obvious the later successful one. The PTO's reliance on Dow's "admission" of longfelt need as prima facie evidence of obviousness is contrary to logic as well as law. Recognition of need, and difficulties encountered by those skilled in the field, are classical indicia of unobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966); *Custom Accessories v. Jeffrey-Allan Industries*, 807 F.2d 955, 960, 1 USPQ2d 1196, 1199 (Fed. Cir. 1986). Further, a patent applicant's statement of the purpose of the work is not prior art.

The Board thus concluded that although one would not know in advance whether the Baer technique would work at all in the presence of diene rubber, or produce a moldable high-impact product, if it did succeed it would have been obvious. The Board criticized Keskkula's evidence for not stating whether, after these inventors proposed the procedure here at issue, Keskkula would have expected the maleic anhydride to react preferentially with the diene rubber or with the styrene and to what effect on the impact properties of the product. The PTO argues that unless the prior art is shown to have led one of ordinary skill to expect the Baer technique to fail, the applicant's burden is not met. This is not the criterion. That these inventors eventually succeeded when they and others had failed does not mean that they or their colleagues must have expected each new idea to fail. Most technological advance is the fruit of methodical, persistent investigation, as is recognized in 35 U.S.C. §103 ("Patentability shall not be negated by the manner in which the invention was made").

The consistent criterion for determination of obviousness is whether the prior art would have suggested to one of ordinary skill in the art that this process should be carried out and would have a reasonable likelihood of success, viewed in the light of the prior art. *See Burlington Industries v. Quigg*, 822 F.2d 1581, 1583, 3 USPQ2d 1436, 1438 (Fed. Cir. 1987); *In re Hedges*, 783 F.2d 1038, 1041, 228 USPQ 685, 687 (Fed. Cir. 1987); *Orthopedic Equipment Co. v. United States*, 702 F.2d 1005, 1013, 217 USPQ 193, 200 (Fed. Cir. 1983); *In re Rinehart*, 531 F.2d 1048, 1053-54, 189 USPQ 143, 148 (CCPA 1976). Both the suggestion and the expectation of success must be founded in the prior art, not in the applicant's disclosure.

In determining whether such a suggestion can fairly be gleaned from the prior art, the full field of the invention must be considered; for the person of ordinary skill is charged

Page 1532

with knowledge of the entire body of technological literature, including that which might lead away from the claimed invention. The Commissioner argues that since the PTO is no longer relying on Farmer or the Bacon and Farmer article, the applicant is creating a "straw man". It is indeed pertinent that these references teach against the present invention. Evidence that supports, rather than negates, patentability must be fairly considered.

[1] The PTO presents, in essence, an "obvious to experiment" standard for obviousness. However, selective hindsight is no more applicable to the design of experiments than it is to the combination of prior art teachings. There must be a reason or suggestion in the art for selecting the procedure used, other than the knowledge learned from the applicant's disclosure. *Interconnect Planning Corporation v. Feil*, 774 F.2d 1132, 1143, 227 USPQ 543, 551 (Fed. Cir. 1985). Of the many scientific publications cited by both Dow and the PTO, none suggests that any process could be used successfully in this three-component system, to produce this product having the desired properties. The skepticism of an expert, expressed before these inventors proved him wrong, is entitled to fair evidentiary weight, *see In re Piasecki*, 745 F.2d 1468, 1475, 223 USPQ 785, 790 (Fed. Cir. 1984); *In re Zeidler*, 682 F.2d 961, 966, 215 USPQ 490, 494 (CCPA 1982), as are the five to six years of research that preceded the claimed invention. The evidence as a whole does not support the PTO's conclusion that the claimed invention would have been obvious in terms of 35 U.S.C. §103.

REVERSED

- End of Case -